



FRIDAY, NOV. 24, 1893

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Contributions.

The Safe Method of Making Meeting Points.

Nov. 15, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Nov. 3, "Accidents for September," I note nine butting collisions through "mistakes in orders." Of these, three seem to be worse than others, viz., at Colehour, on the Pennsylvania; at Leipsic Junction, on the New York, Chicago & St. Louis, and Norwood, on the Rome, Watertown & Ogdensburg. All three lines use the perfected (b) standard code and yet these accidents are possible. Rule 510 says that the ruling train's understanding must be obtained [when practicable] before moving a non-ruling train against it. It is left entirely to the dispatcher as to its being practicable in any case. In fact this is left as a loophole for the company to crawl out of. When anything happens they say it was practicable in this or that case. Now, if practicable at all, why not always? As the officers know that there is a weakness in one rule, with such disastrous results, who else but the company are at fault?

The Delaware & Hudson, the Delaware, Lackawanna & Western and the New York, Susquehanna & Western still stick to the old form and require the ruling train to be held in all cases, and "the right to run is certain, positive and definite, without regard to time."

If this regulation had been in effect on the Pennsylvania are not the chances much greater that the dispatcher would have found his error and have saved 12 human lives? On the R., W. & O., even if the operator failed to hold the train, the inferior train, not having the right to run, would have remained in a safe position. In all these cases it is pertinent to ask if saving 5 or 10 minutes is of more importance than preventing this wholesale slaughter of humanity and reckless destruction of property?

One year ago the management of the New York, Ontario & Western instructed the dispatchers as follows: "Referring to Rule 510, it is considered practicable in all cases to get ruling train's understanding before moving an inferior train against it." That road is a busy single track, ordinarily; yet a heavy World's Fair traffic, together with a large summer passenger business, was handled without any of the embarrassing casualties referred to. Second-class trains frequently are delayed 10 to 15 minutes, but this is preferred to assuming the risks otherwise inevitable. AJAX.

Interior Decoration of Cars Exhibited at the Fair.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the paper read by Mr. Geo. Gibbs at the October meeting of the Western Railway Club the objection made to the stucco work so lavishly used in the ceilings of the Wagner cars that "It is associated in one's mind with plaster and masonry" does not seem the vital one. Perhaps in its treatment of the ceiling the Wagner company adopted a pattern too heavily decorated with raised figures; the massiveness of the ceiling would undoubtedly have been less marked had the figures been few and more delicate, and the idea of plaster and masonry would have occurred to no one. The question seems to be whether "compo." is best suited for the purpose.

Its previous use for the same purpose indicates that it is reasonably durable. Its weight, however, is greater than that of the veneered ceiling generally used. In

car construction a certain amount of material must be used, and properly distributed, to give the necessary strength; to this may be added, and of course generally is added in passenger cars, more or less material for pleasing effects and comfort of passengers. The former of these amounts is a positive quantity, or should be; while the latter may vary with the ideas of the decorator. The decoration should be as light as possible, that the total weight of car may be as small as possible; and for this reason the ceiling of lightest weight is to be preferred, and especially so if just as pleasing effects can be produced as with the heavier material. The objections to the composition for ceilings will apply more emphatically to the use of tile wainscoting and floors, and the use of such material in car work is to be discouraged.

An objection to the heavy figures in the "compo." is that so many places are provided for the lodgment of dust and cinders, the removal of which causes much work. This same objection will apply to the immense amount of carving used in the Pullman exhibition cars. Such decorations, if kept clean and free of dust, are very pleasing; it is no small task, however, to keep them clean, and the richest carving and most elaborate stucco work with backgrounds of dirt are exceedingly distasteful. Carving, while it may do for interior finish of exhibition cars, is to be used sparingly in those for every day service, because of the extra work required to keep it clean. Much better is the plain finish of the English cars exhibited, in which the pretty varieties are produced by different colored woods nicely matched.

C. X.

Railroad Matters in Chicago.

**Freight Traffic.**—The volume of outbound freight over the Western and Northwestern railroads was fairly increased the past week by the cold weather which has augmented the demand for heavy dry goods and other lines of merchandise. As stated in recent letters to the *Railroad Gazette*, jobbers claim that stocks of such goods in the interior are small, therefore continued good shipments are predicted. The most marked increase, however, in the outward shipments was in coal; orders from all points which draw their supplies from here were heavier than at any preceding time since the advent of autumn, and shippers stated that they were unable to load and forward cars as fast as the coal was wanted. The railway officers are looking forward to a heavy outward coal traffic the remainder of the year. Officers of Chicago roads having Milwaukee and other lake port connections in the Northwest also state that their outward bound coal traffic from such points is large, and as the coal sent from there mainly goes in box cars they are returned with wheat. There is considerable disappointment on the part of the Chicago lines at the failure of the lumber shipments from here to increase, but it is claimed that the roads are doing a good business by carrying direct from the mills to consuming sections in the West. Therefore the very moderate business from Chicago.

The inbound grain traffic was larger than generally anticipated. The aggregate deliveries here by 11 Western roads for the week ending Nov. 18 being 4,862,000 bushels, compared with 3,858,000 bushels the corresponding time in 1892, showing an increase of 1,004,000 bushels. There was, however, a loss on flour and miscellaneous produce tonnage. Cattle also decreased 913 carloads. The shrinkage in miscellaneous tonnage was principally due to light arrivals of flour; the roads having lines from Memphis to the Northwest claiming there is no profit in carrying flour from that point to the seaboard at the figures which the "Soo" and Duluth and South Shore lines are taking it. Interviews with the managers of roads traversing the chief agricultural districts fail to discover a very cheerful feeling regarding inward traffic in the near future. General Manager Earling, of the Chicago, Milwaukee & St. Paul system, said: "I have just returned from a trip through the country and found an abundance of property that would readily move to market if prices were satisfactory, but the present low figures for all leading products will prevent a free movement, as farmers think prices will improve later in the season. I therefore look for a very moderate freight traffic the balance of the year." General Manager St. John, of the Rock Island, said: "The prospects for business from now to the close of the year are not very flattering. Our earnings since the opening of November show a small shrinkage as compared with the same time last year. The decrease for the second week was \$17,253, and if we do no worse from this to Jan. 1 we will be fortunate. The loss on freight from the country will mainly be due to the low prices, as there are large stocks back." Officers of the other big roads made similar predictions. General Manager Merrill, of the Burlington system, who has been making personal investigations regarding the corn supply tributary to his lines, thought the crop had been underestimated, but supplies of that grain and all other farm products were likely to be held back for a while because of low prices. Manager McDoel, of the Louisville, New Albany & Chicago, said business was showing a shrinkage, but they were doing very fairly considering the general complaint of dull times, hence he did not look for a very heavy decrease in earnings the balance of the year.

The deliveries of flour and grain at Chicago by each of the 11 Western railways mentioned below, for the

week ending Nov. 18, and the corresponding period in 1892, compare as follows:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
	Bbls.	Bush.	Bbls.	Bush.
C. & N. W.....	14,101	943,000	14,497	618,000
Ill. Cent.....	5,700	608,000	450	473,000
C. R. I. & P.....	12,200	381,000	5,700	283,000
C. B. & Q.....	14,554	944,000	18,952	1,391,000
C. & Alton.....	8,550	475,000	1,500	151,000
C. & E. Ill.....	450	109,000	.....	97,000
C. M. & St. P.....	18,900	712,000	18,390	418,000
Wabash.....	690	216,000	2,100	84,000
C. & G. W.....	16,787	180,000	40,866	233,000
A. T. & S. Fe.....	450	286,000	150	92,000
L. N. A. & C.....	.....	8,000	.....	1,000
Totals.....	92,272	4,862,000	102,605	3,858,000

**Passenger Traffic.**—As was expected, the volume of legitimate travel since the close of the World's Fair has been of moderate proportions, particularly so in travel out of Chicago. The shrinkage is due in part to the fact that many who came here during the closing weeks of the fair on tickets purchased in the interior at reduced rates did not wish to return, sold the return coupons to scalpers at the best prices obtainable, and up to Nov. 15, when such tickets expired by limit, the market was flooded with them. Scalpers knowing that they soon would become worthless forced them on the market, and as the period for their expiration approached those who saw an opportunity to use them made their own prices. As a necessary result the railroads found little demand for outbound tickets at the restored rates, and their receipts from passenger business have been light and show a decrease compared with a year ago.

In referring to the winding up of the World's Fair passenger traffic a general manager said: "Despite the apparent increase in traffic that the fair brought I think it is safe to say that every railroad officer in any way connected with the operating department of the roads is heartily glad that the last train carrying passengers from the fair has delivered them at their destination and the business has again assumed its normal condition. Only those directly connected with the service can appreciate the labor, care and anxiety caused by handling the largely increased number of passengers."

There is considerable friction between the leading Western roads having Missouri River connections with the Eastern trunk lines. The latter insist on changing their running time between the Atlantic cities and Chicago, and in order to make close connections the Western roads will be compelled to materially shorten their running time to leading Western points. This is objectionable to the majority of managers, who claim that the increased speed demanded will prove unprofitable. Referring to the matter, General Manager Merrill, of the Burlington system, said: "The new schedule would compel us to make the time between Chicago and Omaha in 14 hours 30 minutes, or a rate of 30 miles per hour. We protest against the change, but as the Northwestern has adopted it the other roads must protect their interests. The managers of other leading Missouri River roads were still more pronounced in their opposition to faster time, which they said would materially increase the cost of handling trains. The justification offered by the Northwestern is that it is under contract with the Union Pacific to make connections with the latter's through trains to San Francisco and Portland."

CHICAGO, Nov. 20.

Hall Automatic Block Signals on the Chicago & Northwestern.

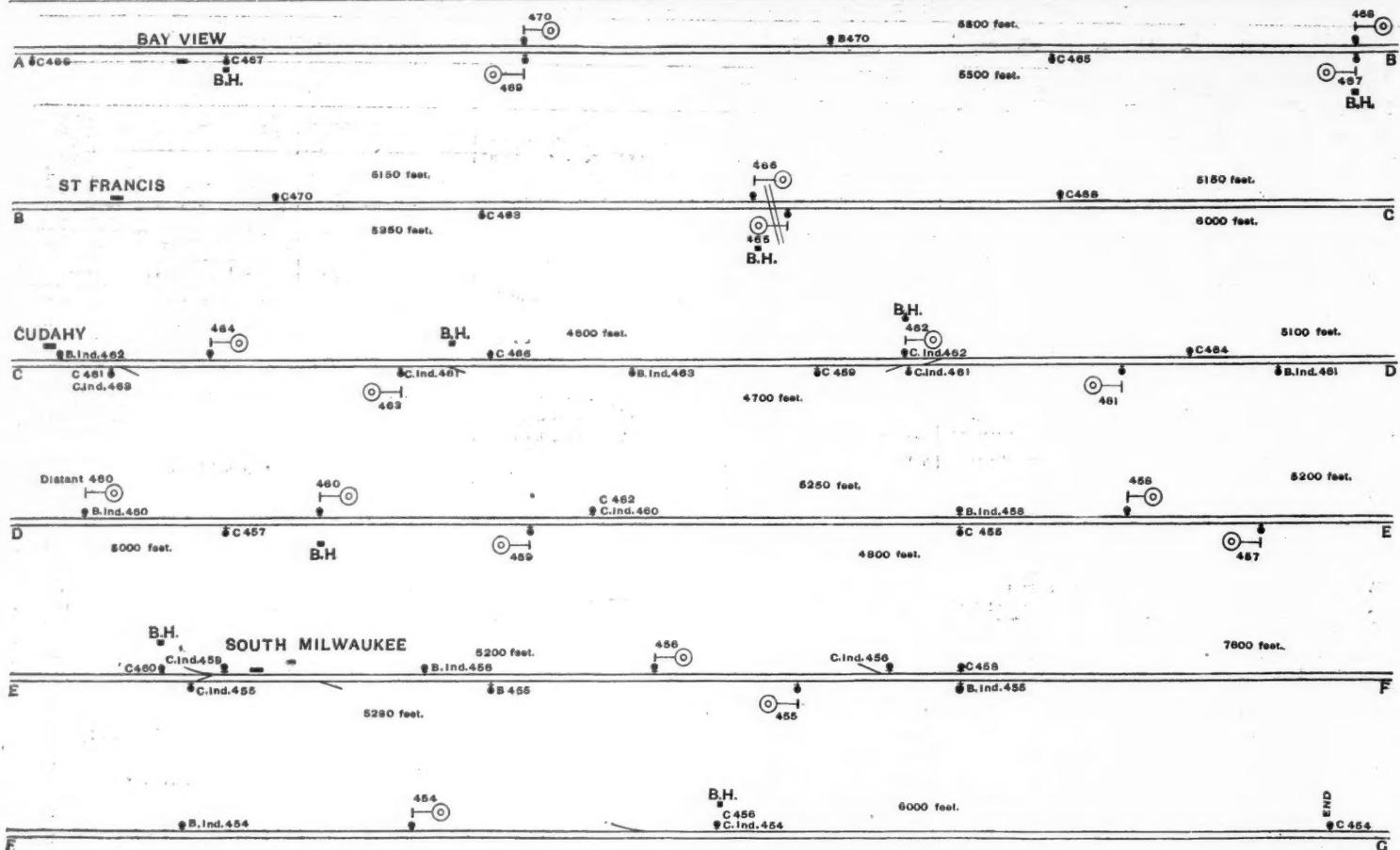
As recently noted in these columns the Chicago & Northwestern has contracted for the erection of Hall automatic block signals, operated by wire circuits, on about 11 miles of its double track line near Milwaukee. This part of the road has few and easy curves, the sharpest being between signals 463 and 464. The distances in feet from one signal to another are indicated by figures on the diagram.

In this installation the signal at outlying switches is a disc instead of a bell, and the signal is operated by a special track instrument. For instance, the disk at the switch marked C Ind. 460 is turned to danger by a train approaching from the north when it passes the track instrument marked B Ind. 460; thus a man at the switch will have ample warning of the approach of the train before it enters the block section, and there is no danger that he will turn signal 460 to danger just at the moment when an engine is passing it. By the use of the disk instead of a bell any failure of battery or wires throws the signal to the danger position and thus gives warning of the failure.

The general arrangement of these signals is the same as that of the Hall automatic block signals heretofore illustrated in the *Railroad Gazette*; for example, a south bound train passing signal 460 sets that signal at danger by the operation of the track instrument fixed opposite to it, and restores the signal to the clear position when it reaches the track instrument at C 460, well beyond the next block signal, 458.

The line wires are insulated and carried in trunking, 5 in. x 5 in., supported on short posts 6 ft. apart. The batteries are to be placed in cylindrical brick battery wells, covered by a frame house, 6 ft. x 7 ft.

The Hall Signal Co. has also contracted to erect sig-



Hall Automatic Block Signals on the Chicago & Northwestern Railway.  
A is the north end, G the south end. Each line represents a track. Trains run on the left hand track.

nals for four block sections near Dixon, Ill., where some clock-work automatic signals are to be taken out. The Chicago & Northwestern already has about 200 miles of track equipped with the Hall signals, as described in the *Railroad Gazette* of Jan. 13 last.

#### The Forging of Eye-Bars and the Flow of Metal in Closed Dies.\*

BY H. V. LOSS, M. E., M. AM. SOC. M. E.

The modern requirements of heavy bridge-building have given rise to special manufactures involving peculiar processes for many of the main features embodied in the structures of to-day. Chords, posts, eye-bars, and even the larger nuts, clevises and other less important details, are made to-day at our leading bridge establishments by methods that were never thought of years ago, that is, before the introduction of the present long spanned and heavy structures. The most typical detail of an American bridge is the eye-bar, and it is therefore to be supposed that the manufacture of this article has been the subject of considerable study, thought and experiment. And such is verily the case, which fact can be vouched for by any engineer who will take the trouble to examine the American patent records on this subject. Following the gradual steps of the designs of machinery for this purpose you will find an evolution that represents vast experiments and great outlay of capital, and which also in itself exhibits a true picture of that patient pace which always has to be set if successful results shall ever be obtained.

Eye-bars were originally made exclusively in iron. As steel gradually became introduced on the market, this material found its way, little by little, into bridges and structural work, until now, with the present perfected methods of steel making, it has taken the place of iron to the extent that only one large railroad exists in the United States at the present time which does not permit the use of steel in its bridges. Under these conditions, the vast majority of eye-bars are now made in steel, and this paper will, therefore, unless otherwise noted, refer to bars made from this material. It may be, however, to advantage, before proceeding any further, to refer to the methods that have been used, or are at present in vogue, for the manufacture of iron bars, especially since bars of this material were the first ones made, and the processes, as used then, to a certain extent, gave rise to the constructions adopted in later years in the manufacture of steel bars.

#### IRON EYE-BARS.

Iron bars† were originally made by "piling," that is, by placing a piece or a number of pieces of the same material on the end of the bar, inserting this end in a furnace and there heating it to a good welding heat. The bar was then transferred to a die, having the finished contour of the eye, and there subjected to the blows of a hammer, which finished it to the correct shape and thickness. A partial "upsetting" of the solid

bar was, however, tried at a very early date, and the methods in vogue to-day represent both of these two systems with such additions or details as many years experience has proved to be profitable. There are several ways in which "piling" is accomplished.

The necessary pieces may all be added on one side—the top—or they may be subdivided between top and bottom. Again, a third method may be adopted of folding the piece over the end of the bar, with or without additional pieces on top or bottom, as indicated by fig. 1. The bar while under the hammer is subjected to an occasional turn to insure sharper edges and smoother surfaces. At times, with large eyes, it has been found troublesome to fill the extreme corners,

and in such events a bottom die, with a punch attached to it, will force the material, which is displaced from the center, out toward the periphery. The top of the punch must be slightly below the top surface of the finished eye to prevent contact with the top die. See fig. 2.

This very same arrangement is also at times used in the manufacture of steel bars, where such are finished under a hammer.

As previously mentioned, a partial upsetting from the solid bar has been used in connection with the final action of the hammer, and such a process is in extensive

use to-day, both for steel and iron. One thing is very certain, however, that with iron bars the hammer *must* do the main part of the work, as, if otherwise is the case, the bar, when placed in a testing machine, is very sure to break in the eye unless the relation between diameter of head and width of bar is exceedingly large. This re-

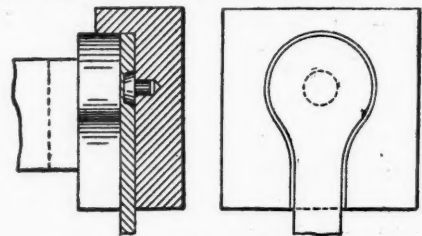


Fig. 2.

lation is, nevertheless, in all instances very much in excess of what it needs to be in steel—the pins being of the same size—regardless of the method by which the iron bar has been made. I have had personal and continued experience in the direction of finishing or almost finishing iron eyes on the upsetting machine. At the Pencoyd Iron Works a number of bars (5) were upset to a finish, except allowing them to thicken about  $\frac{1}{8}$  in. to  $\frac{3}{8}$  in. Two of them were subsequently reduced by a hammer.



Fig. 1.

TABLE NO. 1.—FORGED IRON EYE-BARS FOR TESTING THE RELATIVE VALUES OF UPSET AND ROLLED, AND UPSET AND HAMMERED, IRON BARS.

	Marked.	Diameter of head, B-P.	Thickness, C-C, Average.	Thickness, D-D, Average.	Length, C-C, A.	Diameter of pinhole, inches.	Distance, E-E, inches.	No. heats for upset.	Method of forging.	Excess in head.	Elastic lim. Lbs.	Ultimate in lbs.	Broke in.
Heads	1	12 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{3}{4}$ "	11'-1"	4 $\frac{1}{2}$ "	3 $\frac{3}{4}$ "	4	Upset and rolled Upset and rolled	52%	34,680	47,900	Eye
	1°	12 $\frac{1}{2}$ "	1 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "	.....	4 $\frac{1}{2}$ "	3 $\frac{1}{4}$ "	4					
Heads	2	12 $\frac{1}{2}$ "	1 $\frac{3}{4}$ "	1 $\frac{1}{2}$ "	11'-5 $\frac{1}{4}$ "	4 $\frac{1}{2}$ "	3 $\frac{3}{4}$ "	4	Upset and rolled Upset and rolled	58%	31,720	48,000	Eye
	2°	12 $\frac{1}{2}$ "	1 $\frac{3}{4}$ "	1 $\frac{1}{2}$ "	.....	4 $\frac{1}{2}$ "	3 $\frac{1}{4}$ "	4					
Heads	3	12 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{3}{4}$ "	11'-1 $\frac{1}{2}$ "	4 $\frac{1}{2}$ "	3 $\frac{1}{4}$ "	4	Upset and rolled Upset and rolled	61%	32,000	47,140	Eye
	3°	12 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{3}{4}$ "	.....	4 $\frac{1}{2}$ "	3 $\frac{1}{4}$ "	3					
Heads	4	12 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{3}{4}$ "	10'-10 $\frac{1}{4}$ "	4 $\frac{1}{2}$ "	3 $\frac{3}{4}$ "	2	Upset and hammered Upset and hammered	67%	32,110	52,330	Bar
	4°	12 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{3}{4}$ "	.....	4 $\frac{1}{2}$ "	3 $\frac{1}{4}$ "	2					
Heads	5	12 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	7'-11 $\frac{1}{4}$ "	4 $\frac{1}{2}$ "	3 $\frac{3}{4}$ "	2	Upset and hammered Upset and hammered	69%	32,000	53,360	Bar
	5°	12 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	.....	4 $\frac{1}{2}$ "	4"	Have no account of the No. of heats.					

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† A very old way of making iron eye-bars was to manufacture the eye separately and afterward weld it to the main body of the bar. The uncertainty as to strength of a bar made by this method is very obvious.



TABLE NO. 2.—HAMMERED EYE-BAR HEADS, KEYSTONE BRIDGE CO., PITTSBURGH, PA., FEB. 24, 1886.

Dimensions of heads.

Ratios.

Addition to l'gth from c. to c. of pins required for two finish'd heads.

Waste in manufacturing — 30 per cent.

Ordered material for two heads and waste.

Number of die (lb).	Width of bar.	Diameter of pin.	Dimensions of heads.						Ratios.		Addition to l'gth from c. to c. of pins required for two finish'd heads.	Waste in manufacturing — 30 per cent.	Upset.				Top piling.				Loop piling.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
			H		h		c		R = r				Net width through pin : width of bar.	Diameter of pin : width of bar.	Add to length of bar c. to c. pins.	Add to length of bar c. to c. pins.	Required for piling pieces.	Total additional l'gth ordered.	Bar.	Loops.		Top and bott'm plates.		Length of bar equivalent to material ordered.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
			In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.										In.	No. of pieces.	Width.	Length.		No. of pieces.	Size.	Thick-ness.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
26	2 1/2	3 3/8	7 3/4	4 1/8	3 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1.50	1.45	1 1/2	1 1/2	2 1/2	2 1/2	3 1/2	3 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

\* Floor beam hangers.

the other three by a pair of rolls. The results in the testing machine are shown by table No. 1.

By excess in head is understood the percentage of extra material in the head around the pin, as compared with the body of the bar; or, using the letters in the above table, the excess becomes

$$= \frac{2 E \times D - 1\frac{7}{8} \times C}{1\frac{7}{8} \times C}$$

All rolled bars broke disastrously, and the feature that certainly saved the hammered ones was the very large excess, an amount which is far ahead of what is considered good practice. No well proportioned eye-bar of ordinary dimensions ought to require over 50 per cent. in excess, regardless of material, and the subsequent tables show the standard practice as used by the leading makers to be inside of this limit.

The most important manufacturers at the present time of iron bars, who adhere to the "piling method," are the Keystone Bridge Co., of Pittsburgh, Pa., and the Philadelphia Bridge Works, of Pottstown, Pa. The standard shapes, as adopted by the former works, are shown on table No. 2, which table also gives the size of "piling" pieces necessary to form the eye.

(TO BE CONTINUED.)

### Locomotive Exhibits at the World's Fair.—III.

In the *Railroad Gazette* of June 16, 1893, was begun a continued table giving small cuts and tables of dimensions of locomotives exhibited at the World's Fair. The second part of the table appeared in the issue of Oct. 27, and it is concluded in the present issue, so far as the American locomotives are concerned. Where blanks appear in the table it was impossible to obtain the desired data. The table and cuts appear on the four pages immediately following this.

**The Society of Naval Architects and Marine Engineers.**

On Thursday and Friday, Nov. 13 and 17, the first general meeting of the Society of Naval Architects and Marine Engineers was held in New York City. The President of the Society, Mr. Clement A. Griscom, President of the International Navigation Co., was in the chair. The attendance was large, and included many distinguished men, the membership embracing officers of the navy and men eminent in shipbuilding, marine engineering and water transportation. The meeting was an important and significant event as marking a great step in the rehabilitation of the United States marine. We gave last week, in a note announcing this meeting, a list of the first officers of the organization and the titles of a few of the papers to be presented. The names of the officers elected at the annual meeting and a full list of the papers presented will be given below.

### EVOLUTION OF THE ATLANTIC GREYHOUND.

The first paper read had the above title and was by Mr. Charles H. Cramp, President William Cramp & Sons Ship & Engine Building Co., Vice-President of the Society. Mr. Cramp said that now for the first

time in 20 years domestic capital and enterprise are beginning to look to the ocean for a field of operation and to steamships for investments. Considering these facts, it is timely to make a review of the development of fast liners which has taken place in the last 20 years, that period marking the era between the abandonment of ocean traffic by our people and the beginning of their efforts to resume it. During this period the prime effort of the transatlantic companies has been to reduce time, and this effort has been so marked and persistent as to create the aspect of a perpetual race. He then follows with a review of the development of the transatlantic liners, giving dates of the construction and particulars of the dimensions and power of the typical ships built.

The first real send-off was given by the Inman Company with the City of Brussels, which broke the record by a passage of 7 days, 22 hours and 3 minutes. This was the first passage below the eight-day limit. The White Star Company followed with the Oceanic, and this ship was quickly followed by the Adriatic and Celtic, brought out in 1871 and 1872. The City of Brussels registered 3,090 gross tons, her displacement being 6,900 tons, and developed 3,020 I. H. P. and realized an average speed of 14.54 knots in her best trip. The Oceanic was somewhat larger. The Adriatic and Celtic were 3,886 gross tons, with 3,880 I. H. P. The Adriatic reduced the westward time to 7 days, 16 hours and 26 minutes. Mr. Edward J. Harland, a member of the Belfast firm which built the White Star ships and its chief naval architect, was soon knighted in recognition of his services.

Shortly after the American Steamship Company was formed, and built in the yards of the Cramp Company the Indiana, Illinois, Pennsylvania and Ohio. These ships were not so large or powerful as the White Star ships. These soon passed under the control of the International Navigation Co., and after 20 years continuous service have been re-engined with triple expansion engines.

In 1873 the Inman Company brought out the City of Chester and the City of Richmond, of 4,780 tons, the Chester developing 4,300 H. P. These ships did no lower the record for speed. In 1873 the Inman Company gave to Caird & Co., of Greenock, a commission to build the City of Berlin, 5,490 tons and 5,200 I. H. P., which vessel brought the record down to 7 days, 15 hours and 28 minutes. Contemporaneously the White Star Co. brought out the Germanic and Britannic from the yard of Harland & Wolff, slightly smaller than the City of Berlin but of greater horse power, which ships lowered the record to 7 days, 6 hours and 52 minutes. Up to 1879 these vessels held the pennant.

In 1879 the Guion Line built the Arizona at Elders works, a ship of 5,164 gross tons and 6,640 I. H. P. She lowered the record to 7 days, 3 hours and 38 minutes, and kept the record for two years. In 1881 the Guion people built the Alaska also at Elder's. Her tonnage is 9,500 and horse power 11,800. She made the westward

trip in 6 days, 18 hours and 47 [sic] minutes, with an average speed of 17.44 knots, but the Barrow Ship Building Co. brought out the City of Rome in the same year, and she was a fierce rival of the Alaska. Finally the Rome made the passage in 6 days and 18 hours, beating the Alaska's best time by 37 [sic] minutes. The Rome is a vessel of 8,140 tons with 11,500 I. H. P. While the Rome was a fast ship she was not entirely satisfactory, was thrown back on the hands of her builders, and after some alteration was put in service by the Anchor Line, where she still remains.

In 1833 the Thompsons built the *America* for the National Line, which ship was something of a departure from the fashion then current, being shorter and of greater beam. Her gross tonnage was 5,528 and horse power 9,500. She crossed the Atlantic in 6 days, 14 hours and 16 minutes, a sustained speed of 18.41 knots. Though the smartest ship of her time she was unprofitable, her carrying capacity being too small, and she is now in the service of Italy as an armed transport and torpedo depot ship.

The Oregon was built in 1883 by Sir William Pearce, of Elder's, for the Guion Line. Her engines were the most massive and powerful built up to that date, developing 13,200 H. P. She made an average speed of 13.53 knots, making a record of 6 days, 9 hours and 22 minutes. She was purchased by the Cunard Company after having had a little military experience in the Russian scare, and was sunk in collision off Long Island.

In 1884 and 1885 the Cunard Company brought out the Umbria and the Etruria, both built at Fairfield. These ships are 8,120 tons, and the Etruria's engines develop 14,840 H. P. They reduced the record to about 6 days, and each has made at least one passage in slightly less time. Up to 1889 these were the fastest transatlantic liners, and it was evident that in these vessels the possibilities of single screws had been exhausted. Beyond them twin screws must be used.

In the years 1885, 1886 and 1887 the German Company, the North German Lloyds, brought out the Aller, the Saale, the Trave and the Lahn. These ships were all built at Fairfield, were single screw vessels, but had the distinction of introducing the triple expansion engine for transatlantic craft. They are smaller in tonnage and lower in horse power than the highest of the vessels mentioned before, but are fast, the Trave having reached a sustained speed of 18.6 knots. In 1889 and 1890 the Hamburg Company brought out two English ships, the Columbia and Normannia and one German ship, the Prince Bismarck. The Columbia has twin screws 14,000 H. P., and a mean speed of 19.15 knots, equivalent to a passage of 6 days on the Queenstown route. The Normannia has developed over 15,000 H. P. with a mean speed of 19.33 knots. The Bismarck is reported to have developed 16,800 H. P. as a mean of 6 days.

The French have done less than the Germans, but in 1901 they brought out the Touraine, built at St. Nazaire, the first French liner with twin screws. She is

## DETAILS OF LOCOMOTIVES EXHIBITED AT THE WORLD'S COLUMBIAN EXPOSITION.—THIRD ARTICLE.

Illustrations and principal dimensions of these locomotives are shown on preceding pages.

Explanation of Table.—The first line of the heading in each column refers to the first line of data for each engine; the second line for the second line of data, and so for the four or five lines of heading in each column.

Cut Number.	Name of builder.	Name of company for which built.	Simple or compound. Kind of fuel. Gauge. Name or number.	Center to center of main connecting rod. Horizontal thickness of piston. Kind of piston packing. Piston rod diameter. Size of steam ports.	Exhaust port, size. Valve, greatest travel. Valve, outside lap. Valve, inside lap. Valve, lead.	Journals, driving axle, size. Journal, truck axle, size. Journal, main crank pin, size. Journal, coupling rod, size.
1.		Baltimore & Ohio....	..... Simple Bituminous coal 4 ft. 8¾ in. No. 887	7 ft. 11¾ in. 4¾ in. ..... 3 in. 1½ in. × ...	3 in. × ..... 7 in. 1¾ in. 1½ in. clearance. ½ in.	8 × 9½ in. 5 × 10 in. 5½ × 5¼ in. 4 × 3½ in. .....
2.		Baltimore & Ohio....	..... Simple Bituminous coal 4 ft. 8¾ in. No. 1,342	9 ft. 3¼ in. 6 in. ..... 3½ in. 15½ × 18 in.	2¾ × 18 in. 5½ in. ¾ in. None ½ in.	8 × 9½ in. 5 × 10 in. 5½ × 5¼ in. 5 × 6 in. .....
3.		Baltimore & Ohio....	..... Simple Bituminous coal 4 ft. 8¾ in. No. 888	7 ft. 6 in. 6¾ in. ..... 3½ in. 15½ in. × .....	2¾ in. × ..... 6 in. 1 in. ¾ in. clearance ½ in.	8 × 9½ in. 5 × 10 in. 5½ × 5¼ in. 4½ × 4½ in. .....
4.	Pittsburgh Locomotive Works.....	Experimental purposes.....	..... Compound. 4 ft. 8¾ in. No. 1,452	7 ft. 1½ in. ..... ..... 3½ in. H. P., 15½ × 16 in.; L. P., 1¾ × 18 in.	H. P., 2½ × 16 in.; L. P., 3¼ × 18 in. H. P., 5 in.; L. P., 6 in. H. P., 1 in.; L. P., ¾ in. Clearance, H. P., ½ in.; L. P., ½ in. H. P., ½ in.; L. P., ½ in.	8 × 10 in. 5½ × 10 in. 5½ × 6 in. 4½ × 4 in. .....
5.	Pittsburgh Locomotive Works.....	Cincinnati, Hamilton & Dayton.....	..... Simple 4 ft. 8¾ in. No. 318	8 ft. 9 in. ..... ..... 3¼ in. 1¼ × 16 in.	2½ × 16 in. 5 in. ¾ in. ¾ in. ½ in.	7 × 9 in. 5 × 9 in. 5 × 6 in. 4½ × 4 in. .....
6.	Pittsburgh Locomotive Works.....	Terre Haute & Indianapolis.....	..... Simple 4 ft. 9 in. No. 1,450	9 ft. 6½ in. ..... ..... 3½ in. 15½ × 18 in.	3 × 18 in. 5 in. ¾ in. ¾ in. ½ in.	8 × 10 in. 5½ × 10 in. 5½ × 6 in. 5 × 3½ in. .....
7.	Pittsburgh Locomotive Works.....	Columbus, Hocking Valley & Toledo.....	..... Compound 4 ft. 8¾ in. No. 115	7 ft. 1 in. ..... ..... 3½ in. H. P., 1¼ × 18 in.; L. P., 1½ × 20 in.	H. P., 2½ × 18 in.; L. P., 3 × 20 in. H. P., 5 in.; L. P., 6 in. ¾ in. both Clearance, H. P., ½ in.; L. P., ½ in. H. P., ½ in.; L. P., ½ in.	8 × 9 in. 5 × 9 in. 5 × 6 in. 4½ × 3½ in. .....
8.	Pittsburgh Locomotive Works.....	Pittsburgh Locomotive Works.....	..... Simple 2 ft. 0 in. No. 1,454	48½ in. ..... ..... 1¼ in. ¾ × 5 in.	1¼ × 5 in. 2½ in. ½ in. 0 ½ in.	4 × 6 in. 2¼ × 2½ in. 2¼ × 1¾ in. .....
9.	Canadian Pacific.....	Canadian Pacific.....	..... Simple Bituminous coal 4 ft. 8¾ in. No. 625	9 ft. 4 in. 4¼ in. ..... C. I. rings ¾ in. 1½ × 18 in.	3½ × 18 in. 6½ in. ¾ in. None ¾ in.	8 × 8½ in. 5 × 8 in. Main 4¾ × 5¼ in., wrist 3½ × 3¼ in. Main 5½ × 4½ in., ends 4 × 3¼ in. .....
10.	Richmond Locomotive and Machine Works.	Chesapeake & Ohio....	..... Simple Bituminous coal 4 ft. 8¾ in. No. 350	9 ft. 5¼ in. 4¾ in. on face, 5¼ in. middle ..... 3½ in. 1¼ × 16 in.	2½ × 16 in. 5½ in. ¾ in. 0 in. ½ in.	7 × 8½ in. 5 × 8¾ in. 5½ × 5¼ in. Main 5½ × 4½ in., F. & R. 3½ × 3½ in. Second wheel 4 × 4 in.
11.	Old Colony Railroad....	Old Colony Railroad.	..... Simple 4 ft. 8¾ in. No. 256	..... ..... ..... ..... .....	..... ..... ..... ..... .....	..... ..... ..... ..... .....
12.	H. K. Porter & Co. ....		..... Simple Coal 4 ft. 8¾ in. "Little Mogul," No. 1	5 ft. 8¼ in. 4¼ in. C. I. rings sprung into solid head 2½ in. 11½ × ¾ in.	11½ × 19½ in. 5½ in. ¾ in. ¾ in. ½ in.	5½ × 7 in. 3½ × 5½ in. 3½ × 4 in. F. & R. 3¼ × 3 in. M. 3½ × 3 in.
13.	H. K. Porter & Co. ....		..... Simple Coal 4 ft. 8¾ in. Logger No. 5.	4 ft. 9½ in. 3½ in. C. I. rings sprung into solid head 1½ in. 7½ × ¾ in.	7½ × 1¼ in. 2½ in. ¾ in. ¾ in. ¾ in.	4½ × 4½ in. 3½ × 5½ in. 2¼ × 2¼ in. F. 2½ × 2½ in. B. 2½ × 2½ in.
14.	H. K. Porter & Co. ....		..... Simple 4 ft. 8¾ in. Suburban, No. 3	4 ft. 9½ in. 3 in. C. I. rings sprung into solid head 1¼ in. 6¼ × ½ in.	6¼ × 1 in. 2 in. ¾ in. ¾ in. ¾ in.	3½ × 4¼ in. 3½ × 5½ in. 1½ × 2½ in. F. 1¾ × 2 in. B. 2 × 2 in.
15.	H. K. Porter & Co. ....		..... Simple 3 ft. Contractor, No. 4.	5 ft. 9¾ in. 3½ in. C. I. rings sprung into solid head 1½ in. 7½ × ¾ in.	7½ × 1¼ in. 2½ in. ¾ in. ¾ in. ¾ in.	4½ × 4½ in. 3½ × 5½ in. 2¼ × 2¼ in. F. 2½ × 2½ in. B. 2½ × 2½ in.
16.	H. K. Porter & Co. ....		..... Simple 3 ft. "Midget," No. 2	4 ft. 1½ in. 2½ in. C. I. rings sprung into solid head 1¼ in. 5 × ½ in.	5 × ¾ in. 1½ in. ¾ in. ¾ in. ¾ in.	2½ × 3¾ in. None 1½ × 2½ in. F. 1¾ × 2 in. B. 2 × 2 in.

8,863 tons, triple expansion engines, developing a mean average of 13,600 I. H. P., and has made a speed equivalent to a Queenstown record of 6 days, 4 hours and 35 minutes. She has shown some remarkable spurts of speed and is one of the handsomest ships afloat.

We have given above only a short synopsis of Mr. Cramp's most interesting and useful record, having omitted several vessels and many details of dimensions and engines.

He next considers the New York, the Paris, the Ma-jestic, the Teutonic, the Campania and the Lucania. To the International Navigation Co., in procuring the building of the New York and Paris, belongs the credit of inaugurating the evolution from single to twin screws in passenger ships, and of first offering to the public steamships so subdivided as to be unsinkable with three compartments flooded and having no water-tight doors under the water line. In all

progress so far noted there is no improvement of model. The principal fad of the great English builders is an aversion to statical stability. One of their standard authorities has recently said: "A ship will roll; you cannot help that; therefore the problem is to make her period as long and her motion as easy as possible." In pursuit of an easy roll they design models without initial stability and make them stand up by great quantities of water ballast or other



## DETAILS OF LOCOMOTIVES EXHIBITED AT THE WORLD'S COLUMBIAN EXPOSITION.—THIRD ARTICLE.

Illustrations and principal dimensions of these locomotives are shown on preceding pages.

Explanation of Table.—The first line of the heading in each column refers to the first line of data for each engine; the second line for the second line of data, and so for the four or five line of heading in each column.

Boiler, type. Boiler, material in barrel. Boiler, thickness of barrel. Boiler, kind of horizontal seams. Boiler, kind of circumferential seams.	Tubes, material. Tubes, diameter outside. Tubes, length over tube plate. Firebox, length.	Firebox, width. Firebox, depth. Water space, width. Material of outside shell of firebox. Thickness or outside shell of firebox.	Material inside of firebox. Thickness of firebox. Material, firebox tube sheet. Material, smokebox tube sheet. Thickness, tube sheets.	Crown plate stayed Diameter and height of dome. Working steam pressure per square inch. Kind of grate.	Tender, weight, empty. Journals, tender axle, size. Blast nozzle, kind. Blast nozzles, diameter.	Tender, fuel capacity. Tank, water capacity. Wheel base, total, engine and tender. Total length of engine and tender over all.
Straight Steel Butt riveted double cover strips Double riveted lap	Lap welded wrought iron 242 2 in. 11 ft. 5 in. 104 in.	39 in. bottom; 52½ in. at crown sheet 58 in. F.; 55 in. B. 3 in. B. side; 4 in. F. Steel ⅞ in.	Steel ⅞ in. crown; ⅞ in. sides Steel Steel ¼ in.	1 in. diam. staybolts; 4 in. center to center 30 in. out. diam.; 25 in. high 165 lbs. Cast-iron rocking	36,500 lbs. 4¼ × 8 in. Single 4½ in.	12,000 lbs. 3,500 galls. 47 ft. 2¾ in. 58 ft. 6 in.
Straight Steel Butt riveted, double cover strips Double riveted lap	Lap welded wrought iron 210 2¼ in. 13 ft. 1 in. 114 in.	41 in. bottom; 53½ in. crown sheet 58 in. F.; 55 in. B. 3 in. B. side; 4 in. F. Steel ⅞ in.	Steel ⅞ in. crown; ⅞ in. sides Steel Steel ¼ in.	1 in. diam. staybolts; 4 in. center to center 30 in. out. diam.; 25 in. high 165 lbs. Cast-iron rocking	36,500 lbs. 4¼ × 8 in. Single 4½ in.	12,000 lbs. 3,500 galls. 49 ft. 9 in. 60 ft. 1¾ in.
Straight Steel Butt riveted, double cover strips Double riveted lap	Lap welded wrought iron 251 2 in. 11 ft. 10 in. 107½ in.	33½ in. bottom; 54¼ in. crown sheet 69½ in. F.; 54½ in. B. 3 in. B. side; 4 in. F. Steel ⅞ in.	Steel ⅞ in. crown; ⅞ in. sides Steel Steel ¼ in.	1 in. diam. staybolts; 4 in. center to center 31½ in. out. diam.; 22 in. high 165 lbs. Cast-iron rocking	33,500 lbs. 4¼ × 8 in. Double 3½ in.	12,000 lbs. 3,500 galls. 47 ft. 7 in. 58 ft. 7¾ in.
Reduced shell Steel Butt joints, double lapped and sextuple riveted Double riveted	240 2 in. 10 ft. 10 in. 96 in.	40½ in. 3½ in., double riveted Steel ¾ in.	Steel Crown ⅞ in.; sides ⅞ in. Steel Steel ¼ in.	Radial stays 1½ in. diam. 25 × 30 in. 180 lbs. C. I. rocking.	30,600 lbs. 4¼ × 8 in. Single .....	3,500 galls. 47 ft. ¼ in. 57 ft. 9¾ in.
Belpaire Steel Butt joints, double welded, quadruple riveted Double riveted	220 2 in. 12 ft. 5 in. 96 in.	34½ in. S. and B. 3 in.; F. 4 in. Steel ¾ in.	Steel Crown ⅞ in.; sides ⅞ in. Steel Steel ¼ in.	Radial stays 1 in. diam. 30 × 26 in. 160 lbs. C. I. Rocking	24,500 lbs. 3¾ × 7 in. Single .....	3,000 galls. 46 ft. 9 in. 57 ft. 1¾ in.
Radial stay Steel Butt joints, double welded, sextuple riveted Double riveted	300 2 in. 13 ft. 2 in. 114 in.	40½ in. 4 in. double riveted Steel ⅞ in.	Steel Crown ⅞ in.; sides ⅞ in. Steel Steel ¼ in.	Radial stays 1½ in. diam. 30 × 24 in. 180 lbs. C. I. rocking	29,300 lbs. 4 × 8 in. Single .....	4,000 galls. 50 ft. 9½ in. 61 ft. 6½ in.
Wagon top Steel Butt joints, double lapped, sextuple riveted Double riveted	232 2 in. 10 ft. 10½ in. 108 in.	32½ in. S. and F. 4 in.; B. 3½ in. Steel ⅞ in.	Steel Crown ⅞ in.; sides ⅞ in. Steel Steel ¼ in.	Radial stays 24¼ × 30 in. 180 lbs. C. I. rocking	28,800 lbs. 4¼ × 8 in. Single .....	3,600 galls. 48 ft. 4 in. 59 ft. 4¾ in.
Straight Steel Lapped and double riveted Single riveted	20 2 in. 6 ft. 20 in.	22½ in. S. and B. 2½ in.; F. 3 in. Steel ¼ in.	Steel Crown ⅞ in.; sides ¼ in. Steel Steel ¼ in.	Radial stays ¾ in. diam. 16 × 14 in. 150 lbs. C. I. bars	..... ..... Single .....	190 galls. ..... 14 ft. 9 in.
Wagon top Steel (Scotch) Butt joints, double welts Double riveted lap joints	155 2½ in. 12 ft. 11¼ in. 103½ in.	35 in. Sloped from 71¼ to 51 in. S. and B., 3 in.; F., 3½ in. Steel ⅞ in.	Steel ..... Steel Steel ¼ in.	1½ in. steel stays, with 1½ in. screwed ends 27½ in. × 28¼ in. high 180 lbs. Rocking	35,000 lbs. 4¼ × 8 in. Single .....	10 tons 3,000 imp. galls. 48 ft. 4¼ in. 60 ft. 7¼ in.
Straight top, radial stayed firebox Steel (Carnegie) Butt joints, quadruple riveted Double riveted	Charcoal iron 238 2 in. 12 ft. 8 in. 103½ in.	43 in. Average 59 in. 4 in. front; 3 in. sides and back Steel (Carnegie) ⅞ in.	Otis steel. S. ⅞ in.; B., ⅞ in.; Crown, ⅞ in. Otis steel Flange steel ¼ in.	1 in. stays 30 × 32 in. 150 lbs. Rocking	31,800 lbs. 4¼ × 8 in. Single 4½ in.	6 tons 3,500 galls. 48 ft. ¼ in. 59 ft. 1¾ in.
Crown bar ..... .....	211 2 in. 11 ft. 3 in.	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... 3,500 galls. 44 ft. 3¼ in.
Wagon top Steel Lap, double riveted Single riveted	Wrought iron 100 2 in. 108 in. 54¾ in.	B. and T., 36½ in. F. and B., 50½ in. 2¾ in. Steel ¾ in.	Steel ..... Steel Steel ⅞ in.	Crown bars, open pattern 22 × 25 in. 140 lbs. Rocking	12,530 lbs. 3 × 5 in. Double 2¼ × 2½ in.	1.2 tons 1,600 galls. 37 ft. 11¼ in. 46 ft. 2 in.
Straight Steel Lap, double riveted Single riveted	Wrought iron 66 1½ in. 87 in. 36¾ in.	B., 21½ in.; T., 26½ in. F., 40½ in.; B., 40½ in. 2¼ in. Steel ⅞ in.	Steel ..... Steel Steel ¾ in. F. and B.	Crown bars, open pattern 21 × 21 in. 140 lbs. Dump	None None Double 1¾, 1½, 1¼ in.	1,230 lbs. ..... 400 galls. 12 ft. 2½ in. 24 ft. 2½ in.
Straight Steel Lap, double riveted Single riveted	Wrought iron 48 1¾ in. 48 in. 29¾ in.	B. and T., 21 in. F., 32 in.; B., 26 in. 2 in. Steel ¼ in.	Steel ..... Steel Steel ⅞ in.	Radial staybolts 18 × 18 in. 140 lbs. Rocking	None None Single 1½, 1¼ in.	..... ..... 200 galls. 8 ft. 9 in. 19 ft. 4 in.
Straight Steel Lap, double riveted Single riveted	Wrought iron 69 1¾ in. 65 in. 36½ in.	B., 19½ in.; T., 25 in. F., 35½ in.; B., 39½ in. 2¼ in. Steel ⅞ in.	Steel ..... Steel Steel F., ¾ in.; B., ¾ in.	Crown bars, open pattern 21 × 17½ in. 140 lbs. Dump grate	None None Double 1¾, 1½, 1¼ in.	..... ..... 300 galls. 5 ft. 6 in. 17 ft.
Straight Steel Lap, double riveted Single riveted	Wrought iron 48 1¾ in. 44 in. 27½ in.	B. and T., 19½ in. F., 25 in.; B., 23 in. 2 in. Steel ¼ in.	Steel ..... Steel Steel ⅞ in.	Crown bars of open pattern 18 × 18 in. 140 lbs. Dump	None None Single 1½, 1¼ in.	..... ..... 130 galls. 4 ft. 0 in. 12 ft. 4 in. over all

dead weight. When Mr. Cramp undertook the design of the two steamships now building at his yard, Nos. 277 and 278, he abandoned this fad at the outset. He considered that the carriage of water ballast, or other dead weight, not coal or cargo, as radically defective. Any steamship owner who will accept a design that compels him to lug a thousand tons or so of non-paying freight during the life of his ship is not entitled to sympathy. Mr. Cramp then pokes fun at the suggested refinement

of a system of ingress and expulsion of water to and from numerous compartments by means of valve and pump gear under electrical control from a central station. From his experience he has arrived at the first principle of providing as many absolute and unchangeable qualities of performance and safety as possible and putting them beyond manipulation, and the first and most important of these qualities is initial stability.

With regard to the increase of size as an element in

the development of safety he agrees with Dr. Francis Elgar that the limit of commercial practicability has been reached. The operation of Froude's well known law whereby the ratio of indicated horse power to drive a ton of displacement at a given speed decreases in a progressive ratio as the increase of dimensions, naturally led to the Campania, but inexorable hydrographical conditions imposes a limit of one dimension, namely draft, and this imposes a limit on all the other dimensions.

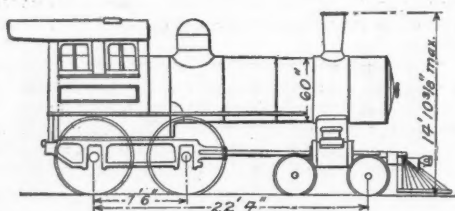


Fig. 1-B. &amp; O.

Cylinders.....19 x 24 in.  
Weight on drivers.....74,300 lbs.  
Weight on truck wheels.....39,500 lbs.  
Weight, total.....113,800 lbs.  
Wheel base, engine.....22 ft. 4 in.  
Wheel base, driving.....7 ft. 6 in.  
Boiler, diam.....60 in.  
H't stack above rails.....14 ft. 10 3/8 in.

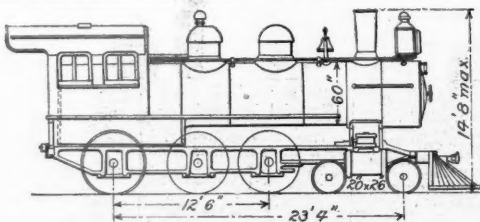


Fig. 2-B. &amp; O.

Cylinders.....20 x 26 in.  
Weight on drivers.....101,500 lbs.  
Weight on truck wheels.....36,000 lbs.  
Weight, total.....137,500 lbs.  
Wheel base, engine.....23 ft. 4 in.  
Wheel base, driving.....12 ft. 6 in.  
Boiler, diam.....60 in.  
H't of stack above rails.....14 ft. 8 in.

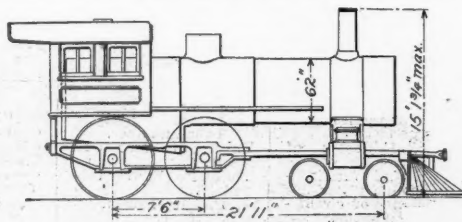


Fig. 3-B. &amp; O.

Cylinders.....20 x 24 in.  
Weight on drivers.....75,210 lbs.  
Weight on truck wheels.....41,590 lbs.  
Weight, total.....116,800 lbs.  
Wheel base, engine.....21 ft. 11 in.  
Wheel base, driving.....7 ft. 6 in.  
Boiler, diam.....62 in.  
H't stack above rails.....15 ft. 3/4 in.

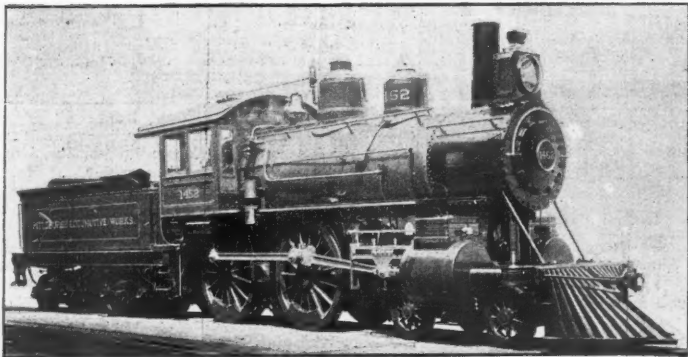


Fig. 4-Pittsburgh.

Cylinders.....19 and 29 x 26 in.  
Weight on drivers.....72,000 lbs.  
Weight on truck wheels.....40,550 lbs.  
Weight, total.....112,550 lbs.  
Wheel base, engine.....22 ft. 6 in.  
Wheel base, driving.....8 ft. 0 in.  
Boiler, diam.....58 in.  
Height of stack above rails.....15 ft. 0 in.

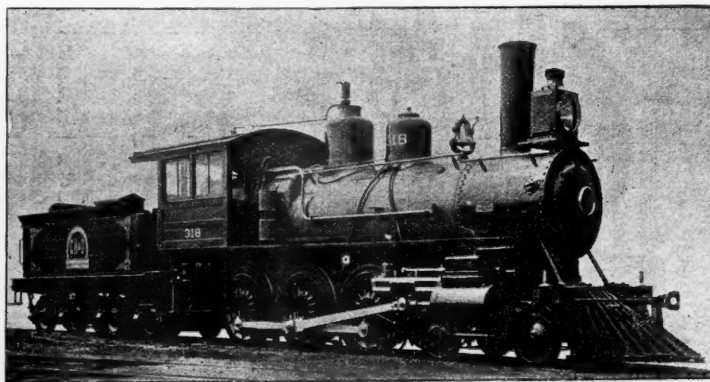


Fig. 5-Pittsburgh-C., H. &amp; D.

Cylinders.....18 x 24 in.  
Weight on drivers.....85,900 lbs.  
Weight on truck wheels.....39,700 lbs.  
Weight, total.....125,600 lbs.  
Wheel base, engine.....21 ft. 0 in.  
Wheel base, driving.....10 ft. 8 in.  
Boiler, diam.....58 in.  
Height of stack above rails.....14 ft. 8 in.

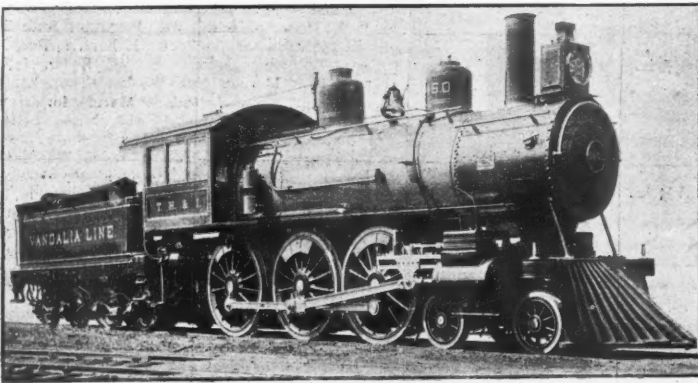


Fig. 6-Pittsburgh-T. H. &amp; I.

Cylinders.....20 x 26 in.  
Weight on drivers.....110,000 lbs.  
Weight on truck wheels.....28,000 lbs.  
Weight, total.....138,000 lbs.  
Wheel base, engine.....23 ft. 8 in.  
Wheel base, driving.....13 ft. 4 in.  
Boiler, diam.....64 in.  
Height of stack above rails.....15 ft. 5 3/8 in.

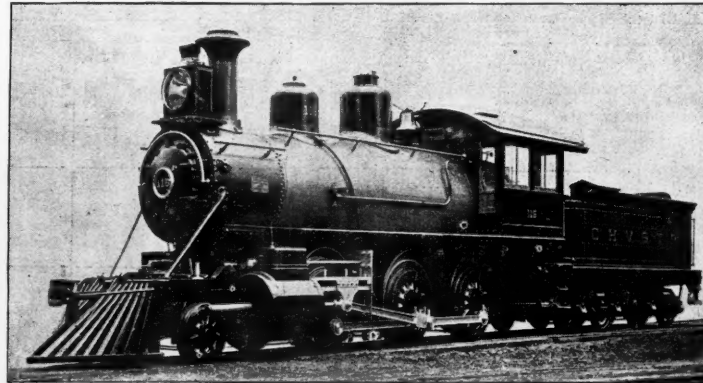


Fig. 7-Pittsburgh-C., H. V. &amp; T.

Cylinders.....19 and 29 x 26 in.  
Weight on drivers.....100,500 lbs.  
Weight on truck wheels.....15,700 lbs.  
Weight, total.....116,200 lbs.  
Wheel base, engine.....20 ft. 10 in.  
Wheel base, driving.....13 ft. 2 in.  
Boiler, diam.....60 in.  
Height of stack above rails.....14 ft. 7 in.

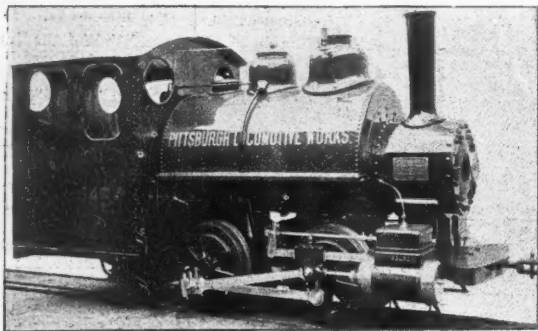


Fig. 8-Pittsburgh.

Cylinders.....6 x 10 in.  
Weight on drivers.....12,500 lbs.  
Weight, total.....12,500 lbs.  
Wheel base, engine.....3 ft. 6 in.  
Boiler, diam.....24 in.

Height of stack above rails.....7 ft. 0 in.  
Heating surface, firebox.....18.6 sq. ft.  
Heating surface, tubes.....62.8 sq. ft.  
Heating surface, total.....81.4 sq. ft.  
Grate area.....3.1 sq. ft.  
Driving wheels, diam.....36 in.

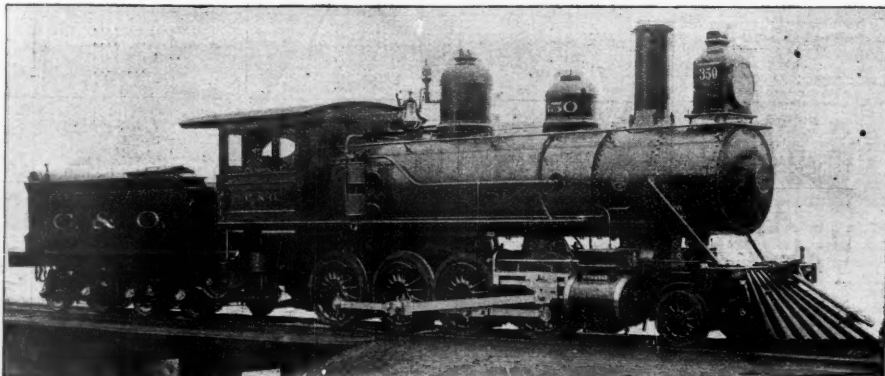


Fig. 10-Richmond-C. &amp; O.

Cylinders.....20 x 24 in.  
Weight on drivers.....100,500 lbs.  
Weight on truck wheels.....16,500 lbs.  
Weight, total.....117,000 lbs.  
Wheel base, engine.....21 ft. 8 in.  
Wheel base, driving.....14 ft. 0 in.  
Boiler, diam.....60 in.  
Height of stack above rails.....14 ft. 7 3/4 in.

Heating surface, firebox.....155 sq. ft.  
Heating surface, tubes.....1,598.4 sq. ft.  
Heating surface, total.....1,753.4 sq. ft.  
Grate area.....30.8 sq. ft.  
Driving wheels, diam.....50 in.  
Engine truck wheels, diam.....30 in.  
Tender truck wheels, diam.....33 in.

## LOCOMOTIVES AT THE WORLD'S COLUMBIAN EXPOSITION—THIRD ARTICLE.

mensions. While Dr. Elgar hopes that bars may be dredged and docks deepened to permit of a 30-ft-draft, it is not worth while to consider this in building the ships of to-day; and now we must accept 28 ft. as the basis of design. There is another limit to the size of a ship which has not been mentioned; it may become too large for the captain. While we may increase dimensions of ships, the size of man is fixed physically and mentally, and the ship must be commanded and manoeuvred in one piece and by one man.

The ratios of depth and beam and length being fixed of a basis of 28 ft. draft, we may have a beam of 70 ft., molded depth of 50 and length of 600 to 620, and that is about the end.

The most important practical reason for using two or more screws is the limitation of the effective or economical diameter of the screw by the inexorable conditions of draft. This must have a certain immersion and the more the better; it should be at least, 9 ft. Draft being practically restricted to 27 or 28 ft., in our Atlantic

harbors, the maximum diameter of a screw is limited. Again, unless you give your engine higher speed than is desirable or economical you cannot put more than 12,000 I. H. P. through one screw, so if you want more than that you must use two screws, and if you want more than 24,000 you must use three. There is no escape from this proposition. This part of his subject Mr. Cramp elaborates somewhat, but this is his fundamental position.

The ships that he is now building for the International



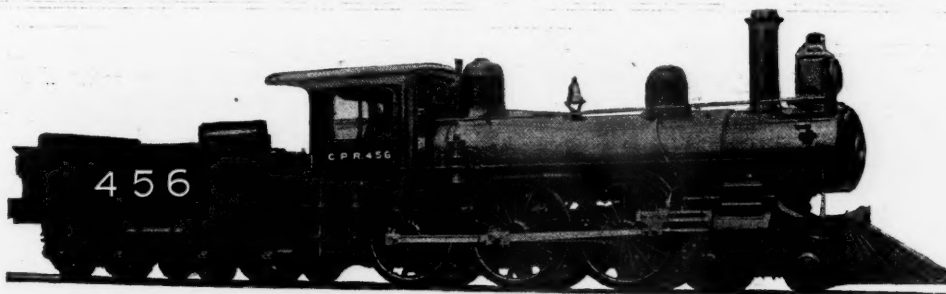


Fig. 9—Canadian Pacific.

Cylinders.....	19 x 24 in.	Heating surface, firebox.....	144.4 sq. ft.
Weight on drivers.....	93,000 lbs.	Heating surface, tubes.....	1,300.9 sq. ft.
Weight on truck wheels.....	27,000 lbs.	Heating surface, total.....	1,445.3 sq. ft.
Weight, total.....	125,000 lbs.	Graze surface.....	25.39 sq. ft.
Wheel base, engine.....	22 ft. 10 in.	Driving wheels, diam.....	69 in.
Wheel base, driving.....	13 ft. 3 in.	Engine truck wheels, diam.....	30 in.
Boiler, diam.....	5.5 in.	Tender truck wheels, diam.....	40 in.
Height of stack.....	14 ft. 11 in.		

NUMBER 11—OLD COLONY—NO CUT.

Cylinders.....	18 x 24 in.	Heating surface, firebox.....	138 sq. ft.
Weight on drivers.....	63,200 lbs.	Heating surface, tubes.....	1,235 sq. ft.
Weight on truck wheels.....	27,000 lbs.	Heating surface, total.....	1,373 sq. ft.
Weight, total.....	90,000 lbs.	Graze surface.....	19 sq. ft.
Wheel base, engine.....	22 ft. 10 in.	Driving wheels, diam.....	69 in.
Wheel base, driving.....	9 ft. 0 in.	Engine truck wheels, diam.....	30 in.
Boiler, diam.....	5.2 in.	Tender truck wheels, diam.....	40 in.
Height of stack above rails.....	12 ft. 3 1/2 in.		

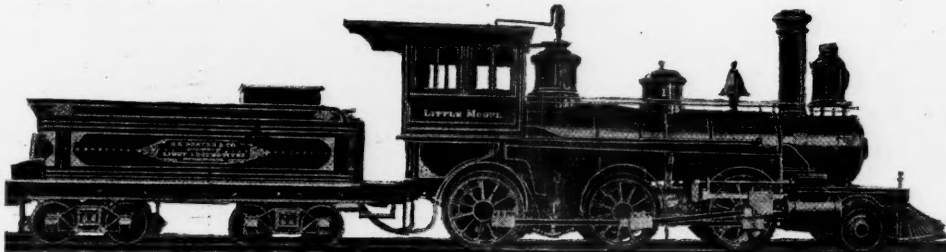


Fig. 12—Porter.

Cylinders.....	14 x 20 in.	Heating surface, firebox.....	71 sq. ft.
Weight on drivers.....	43,000 lbs.	Heating surface, tubes.....	473 sq. ft.
Weight on truck wheels.....	5,000 lbs.	Heating surface, total.....	544 sq. ft.
Weight, total.....	51,000 lbs.	Graze surface.....	14.5 sq. ft.
Wheel base, engine.....	18 ft. 2 in.	Driving wheels, diam.....	44 in.
Wheel base, driving.....	12 ft. 2 in.	Engine truck wheels, diam.....	26 in.
Boiler, diam.....	3.9 in.	Tender truck wheels, diam.....	34 in.
Height of stack above rails.....	12 ft. 3 1/2 in.		

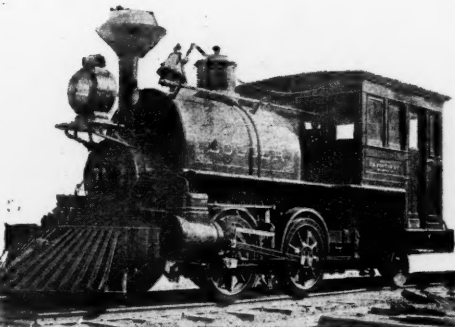


Fig. 13—Porter.

Cylinders.....	9 x 14 in.	H't of stack above rails.....	10 ft.
Weight on drivers.....	21,000 lbs.	Heating surf., firebox.....	36 sq. ft.
Weight on truck wheels.....	5,000 lbs.	Heating surf., tubes.....	220 sq. ft.
Weight, total.....	28,000 lbs.	Heating surface, total.....	256 sq. ft.
Wheel base, engine.....	12 ft. 2 1/2 in.	Graze area.....	6.75 sq. ft.
Wheel base, driving.....	4 ft. 8 in.	Driving wheels, diam.....	33 in.
Boiler, diam.....	3 1/4 in.	Engine truck wheels, diam.....	20 in.

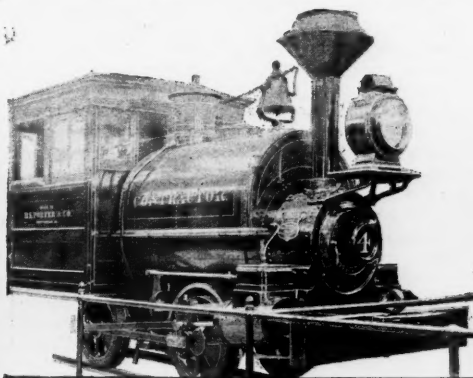


Fig. 15—Porter.

Cylinders.....	9 x 14 in.	Heating surf., firebox.....	29.2 sq. ft.
Weight on drivers.....	22,000 lbs.	Heating surf., tubes.....	165 sq. ft.
Weight on truck wheels.....	5 ft. 3 in.	Heating surf., total.....	194.2 sq. ft.
Weight, total.....	27,000 lbs.	Graze area.....	5 sq. ft.
Wheel base, engine.....	12 ft. 2 1/2 in.	Driving wheels, diam.....	30 in.
Wheel base, driving.....	4 ft. 8 in.		
Boiler, diam.....	3 1/4 in.		
H't of stack above rails.....	9 ft. 7 3/4 in.		



Fig. 11—Porter.

Cylinders.....	7 x 12 in.	H't of stack above rails.....	9 ft. 9 in.
Weight on drivers.....	15,000 lbs.	Heating surf., firebox.....	20.8 sq. ft.
Weight on truck wheels.....	7,000 lbs.	Heating surf., tubes.....	75.2 sq. ft.
Weight, total.....	20,000 lbs.	Heating surface, total.....	96.0 sq. ft.
Wheel base, engine.....	8 ft. 9 in.	Graze area.....	5.1 sq. ft.
Wheel base, driving.....	4 ft. 8 in.	Driving wheels, diam.....	30 in.
Boiler, diam.....	2 3/4 in.	Engine truck wheels, diam.....	18 in.

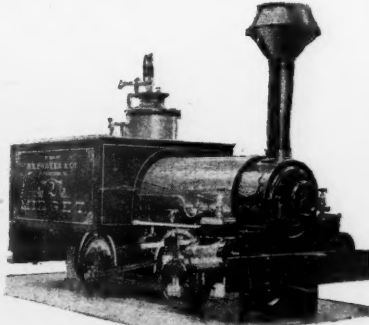


Fig. 16—Porter.

Cylinders.....	6 x 10 in.	Heating surf., firebox.....	19.1 sq. ft.
Weight on drivers.....	10,000 lbs.	Heating surf., tubes.....	69 sq. ft.
Weight on truck wheels.....	4 ft.	Heating surface, total.....	88.1 sq. ft.
Weight, total.....	10,000 lbs.	Graze area.....	3.9 sq. ft.
Wheel base, engine.....	8 ft. 9 in.	Driving wheels, diam.....	22 in.
Wheel base, driving.....	4 ft. 8 in.		
Boiler, diam.....	2 3/4 in.		
H't of stack above rails.....	8 ft. 3 3/4 in.		

LOCOMOTIVES AT THE WORLD'S COLUMBIAN EXPOSITION—THIRD ARTICLE.

Navigation Co. are framed about two-thirds of their length amidships and plating is in progress. They will be launched next spring and will go into commission in about a year from now. Their principal dimensions follow:

Length on load water line.....	536 ft.
Length over all.....	554 ft.
Extreme breadth.....	63 ft.
Molded depth.....	42 ft.
Gross register about.....	11,000 tons.
First cabin capacity.....	320 passengers.
Second ".....	200 "
Third ".....	800 "

They will have twin screws, actuated by two quad-

ruple expansion engines on four cranks, and with 200 lbs. steam will probably develop about 20,000 collective I. H. P. To support the outboard shaft bearings the hull is built out in a horizontal web to a steel frame having both bosses cast in one piece and weighing about 68,000 lbs. These ships are about half way between the New York and Paris on one side and the Campana on the other in dimensions. They will be followed closely by other ships which Mr. Cramp does not describe. The conditions of the mail contract between the government and the International Navigation Co.,

place at the disposal of the navy seven great ships almost immediately convertible into commerce destroyers averaging greater performance than the Columbia and Minneapolis.

No foreign material enters into the construction of these ships, notwithstanding that the law permits the importation of much of the material free of duty. All orders were placed in American mills, forges and foundries. Mr. Cramp concludes that "this is a pretty fair start; but if you are asked what the future has in store you may say, in the words of Paul Jones, on a certain occasion well remembered by Englishmen, 'we are just beginning to fight.'"

The other paper presented at this meeting which seems to us to be of most value and interest was that on "The Production of Heavy Steel Forgings in the United States," read by Mr. Davenport, of the Bethlehem Works. We have not space for an adequate abstract of that extremely valuable paper this week, but shall hope to give one next week.

OFFICERS OF THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS, ELECTED NOV. 17.

President: Clement A. Grison, of Philadelphia, President International Navigation Co.

First Vice-President: Theodore D. Wilson, of Washington, D. C., ex-Chief Constructor, United States Navy.

Vice-Presidents: Chas. H. Cramp, of Philadelphia, President Wm. Cramp & Sons' Ship & Engine Building Co.; George W. Melville, of Washington, D. C., Engineer-in-Chief United States Navy; Geo. W. Quintard, of New York, President Quintard Iron Works; Chas. H. Loring, of New York, ex-Engineer-in-Chief United States Navy; Irving M. Scott, of San Francisco, Vice-President and General Manager Union Iron Works; Francis A. Walker, of Boston, President Massachusetts Institute of Technology; Wm. H. Webb, of New York, Naval Architect (retired); Philip Hichborn, of Washington, D. C., Naval Constructor United States Navy; R. W. Meade, Commodore United States Navy.

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LIST OF PAPERS READ AT THE MEETING.

Trans-Atlantic Navigation: Charles H. Cramp, Esq., President Wm. Cramp & Sons' Ship & Engine Building Co., Philadelphia, Pa.

Steel Ships of the United States Navy: Theodore S. Wilson, ex-Chief Constructor U. S. N.

The Development of Shipbuilding on the Great Lakes: Jno. F. Parkhurst, Esq., Vice-President and General Manager Globe Iron Works, Cleveland, O.

Notes on the Machinery of the New Vessels of the United States Navy: George W. Melville, Engineer-in-Chief U. S. Navy.

Coal Bunkers and Coaling Ships: Albert P. Niblack, Lieutenant U. S. Navy.

Production in the United States of Heavy Steel Engine, Gun and Armor Forgings: Russell W. Davenport, Esq., Vice-President Bethlehem Iron Co., South Bethlehem, Pa.

Determination of the Approximate Dimensions of a Vessel to Fulfill a Given Programme of Requirements: Joseph J. Woodward, Naval Constructor, U. S. N.

Comparative Performances of American and Foreign Freighting Ships—Our Superiority: Wm. W. Bates, Esq., late Commissioner of Navigation Treasury Department.

The Wetted Surface of Ships: David W. Taylor, Naval Constructor U. S. N.

The Influence of Speed and Weight of Machinery on the Determination of the Other Elements of the Design of Steam Vessels: John J. O'Neill, Esq., Naval Architect and Marine Engineer.

United States Treasury Rules for the Inspection of Machinery and Boilers: Jas. T. Boyd, Esq., General Manager George F. Blake Manufacturing Co.

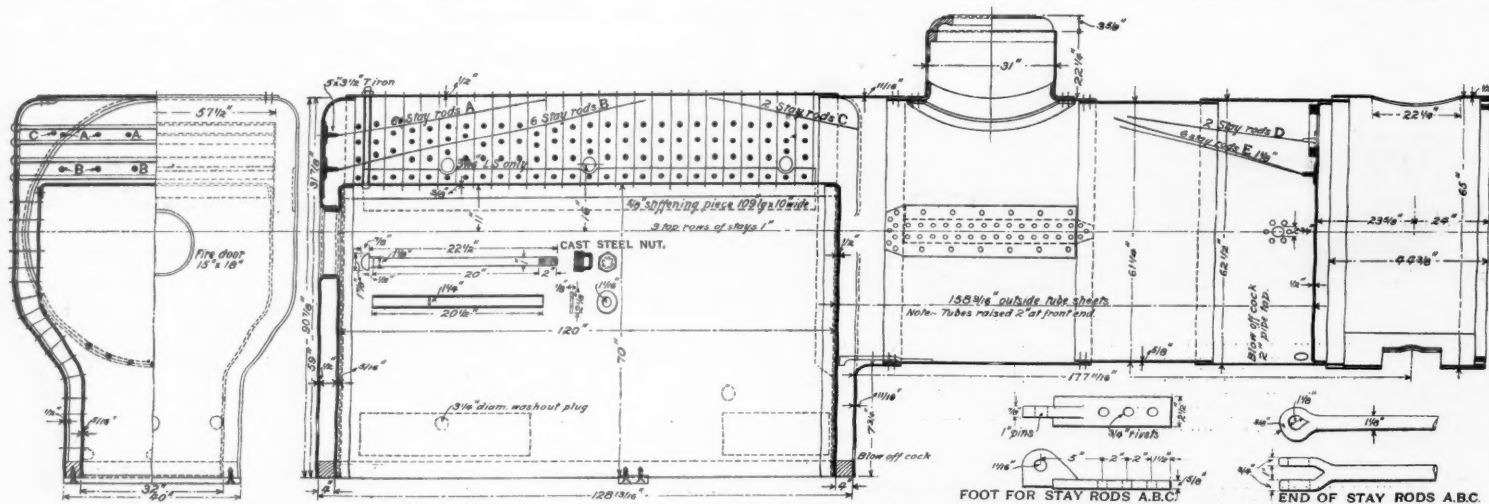
Some Thoughts on the Design of New York Ferry-boats: Col. Edwin A. Stevens, President Hoboken Ferry Co.

Steam Yachts as Naval Auxiliaries in Time of War: Wm. Gardner, Naval Architect.

The Law of Frictional Resistance: Prof. W. F. Durand, Cornell University.

Baltimore's Ship Canal Projects.

In times that are past, commerce of the City of Baltimore was mostly carried on with countries to the south. Lately the preponderance of her trade has been with British and North European ports, so that



BOILER FOR WOOD BURNING, 10-WHEEL, COMPOUND LOCOMOTIVES—MEXICAN CENTRAL RAILROAD.

F. W. JOHNSTONE, Superintendent Motive Power and Machinery.

of its \$13,418,523 in imports and \$98,790,890 of domestic exports, \$6,432,184, or 47.9 per cent. in, and \$95,730,017, or 96.9 per cent. out, is from or to British and European ports in France or countries north of France. Its once magnificent trade with the West Indies is now represented by \$1,412,241 imports and \$456,100 exports, or 1 1/4 per cent. of the aggregate foreign trade.

Under these circumstances the Baltimoreans are looking for a more direct trade to Europe than by the "Virginia Capes." Three routes are proposed: First, the Sassafras route, following a creek of that name. By this route the canal would be 16 miles long and would cost \$8,000,000. It is objected to this route that it enters the Delaware Bay too far from the sea and would be liable to obstructions by ice. Second, the Choptank River route to Lewes, Del., where it enters the sea. This canal is 37 miles long and would cost \$18,000,000. Third, a route from Baltimore direct to Lewes—a canal almost 50 miles long and costing \$34,000,000. This last mentioned route is the most direct for the European trade, saving about 200 miles, as compared with the present route. On the other hand, the Sassafras route is much the best for the internal trade of the country, as Lewes fronts on the open sea, and a route by that port would be impracticable for large traffic.

North of the proposed Sassafras route there is a canal suitable for schooners and barges drawing 8 ft., that was opened in 1829 and cost \$2,225,000, but it locks over a summit and is too small. All of the canals proposed at present will be without any locks other than guard locks rendered necessary by the different periods of the tides in the Chesapeake and Delaware bays. As soon as the deep water canal advocated by Mr. Haupt, between Philadelphia and New York, is completed the canal across Maryland will, if adapted to barge navigation, open an interior route from Norfolk into the Hudson and Long Island Sound, that might have nearly as large a traffic as that passing Detroit.

#### Belpaire Locomotive Boiler Arranged for Wood.

A note in the *Railroad Gazette* of Oct. 27 stated that the Mexican Central was changing its coal burning locomotives to wood burners, and that Mr. F. W. Johnstone, the Superintendent of Motive Power, had designed a boiler for the 10-wheel compound locomotive suitable for using wood fuel. The necessity for this change, as stated, is that the value of silver has so depreciated that coal, which must be purchased outside of Mexico, costs much more than wood, which is obtained in Mexico. The boiler shown with this differs from those for the same class locomotives, in which coal is used, in having a somewhat deeper firebox, and also the firebox door is placed as near the top of the furnace as possible. The deeper firebox allows for the more bulky fuel and the door being well up makes it possible to fill the back of the firebox better than could be done were the door lower.

Aside from the fact that this boiler has been designed for using wood fuel, it is interesting as showing some of the requirements for boilers in which very bad water is to be used. It is especially well provided with blow-off cocks and cleaning plugs; there are three of the former and these are used two or three times each trip over a division to clear the boiler of sediment that would otherwise cause foaming and result in cutting the valves and cylinders. There are two washout plugs in the front outside sheet close to the spacing ring; there are three in the back sheet which, like two similar ones in the outside side sheets, are some distance above the spacing ring. They are probably so spaced to make them more accessible. The inside crown sheet is flat, which is somewhat opposed to the quite general practice of sloping it if bad water is to be used, but just above it are three washout plugs in the outside side sheet, on the left side, through which the top of the crown sheet is cleaned, either with hose-nozzle or scraper. On account of the amount of sediment that collects, the tubes are raised 2 in. at the

front end to keep them free from it; this also facilitates, somewhat, cleaning the boiler. It would undoubtedly be a good plan to leave out several tubes at the bottom, for the same reasons.

The crown sheet stay-bolts are provided with cast steel nuts on the outside of the outside sheet, and have button heads under the inside sheet. The sheets are spaced by lengths of pipe, 1 1/4 in. inside diameter, the stay-bolts being 1 in. in diameter, through which the bolts pass. At each end of the pipe is a washer 2 1/2 in. in diameter and 3/8 in. thick to give large bearing surface on the sheet. Some objection might be raised to the method of staying the upper part of the front tube sheet and the back sheet with diagonal stays to the sides of the barrel and to the side sheets and upper crown sheet respectively. The long rod stays from one sheet to the other would be more convenient and simpler, but it is possible that, in Mexico, the extra material of the long stay would cost more than the extra work on the diagonal stays. A stiffening piece 3/4 of an inch thick, 109 in. long and 10 in. wide, is riveted to the inside of the outside side sheets, its height from the bottom of the spacing ring being the same as that of the firebox crown sheet.

There is a tendency to use shorter smoke-boxes than have prevailed for several years; the illustration shows that on the Mexican Central the extension front end has been entirely discarded.

With the boiler shown a diamond stack is used and its proportions are those which much experimenting have shown to be most suitable. The total height of the stack above top of smoke-box is 57 1/4 in. It is 15 1/2 in. inside diameter in the barrel of the stack and 52 in. in diameter in its largest part. The cone is 28 in. in diameter. The netting in the top recedes into the stack 10 1/4 in., or within 4 in. of the top of the cone. The horizontal netting just above the cone being 25 in. in diameter. The opening in the top of the stack is 36 in. in diameter, so the horizontal netting is connected with the top of the stack by netting in the shape of a frustum of a cone inverted with its smallest diameter downward. The netting used is 8 mesh No. 18 wire.

#### A Large Masonry Arch Railroad Bridge.

The new Stanislaw-Woronienka Railroad, in Galicia, follows the Pruth Valley for some distance, crossing the river repeatedly and passing several side valleys. As the wooded mountains which form the valley contain a very durable limestone as building stone, and furnish timber for falseworks, masonry arches were found to be cheaper than iron bridges, especially as the outcropping rock offers everywhere good foundations. There are six arches with spans ranging from 72 ft. to 213 ft., each with stone viaduct approaches. The largest of them, the Pruth bridge at Jaremce, which is shown by the illustrations, surpasses in length all existing masonry arches for railroad traffic and is excelled only by the Cabin John arch. The arch is 6 ft. 10 1/2 in. thick at the keystone, 10 ft. 2 in. at the skewbacks and is 14 ft. 9 in. wide.

As maximum pressure per square inch of stone has been allowed 391 lbs. The main arch consists of dimen-

sion stones, while the spandrel arches are built of rubble masonry. The arch has two thicknesses of stones, which head into each other. The stones of the inner ring are alternately 3 ft. 3 3/8 in. and 4 ft. 1 1/4 in. long radially. They were all placed without mortar into their exact positions on the centers of the arch, separated from each other by narrow wooden strips, 1/2 in. thick, at the joints of the intrados and of the faces. Portland cement mortar—one part cement in three and a half parts of sand, mixed very dry—was then rammed into the joints. After a lapse of two to three weeks the laying of the upper ring was started at several places and the arch was closed simultaneously at various points. The cost of the complete 213-ft. arch amounts to \$40,400.

#### The Higley Sawing and Slotting Machine.

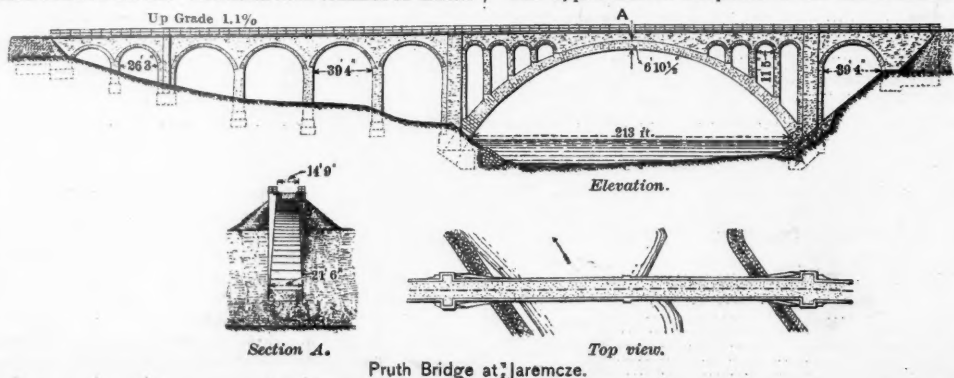
The engravings show a saw and slotting machine made by the Higley Sawing & Drilling Machine Company, of New York. This machine is designed to cut, saw, slab and slot iron and steel in any form or shape, cold. Its makers claim that it has no equal for frog and switch work, or in the fitting of beams and other shapes used in engineering and architectural construction, and that it does accurate and rapid work.

The saw has some mechanical features that are new and valuable. These features include a strong and convenient working bed, an automatic self-adjusting saw-cut feed, an ingenious mechanism for applying the driving power to the saw at or near its periphery, a capacity for long and deep cuts and the complete inclosing of the driving mechanism beneath the bed, where it is protected from injury and dust.

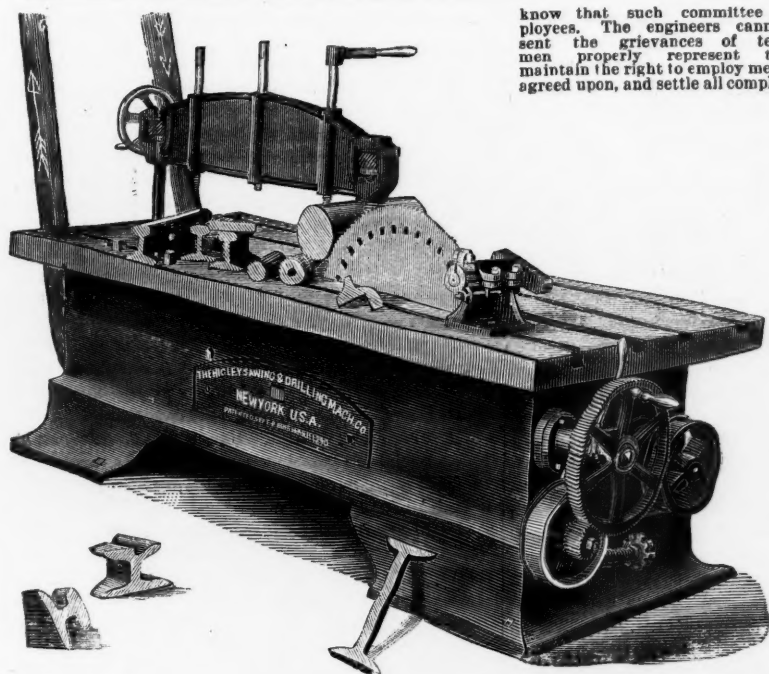
The engravings show clearly these features. Fig. 1 is a general view with the device for clamping the work to the bed. The bed is slotted like an ordinary planer bed, but it is fixed, and the saw with its driving mechanism is made to travel.

The feed gear is plainly shown at the end, but the mechanism is best shown in fig. 3. The power is furnished to the shaft, B, by the belt at the left end of the bed (figs. 1 and 2), and is transmitted to the feed gear through the pulley D. The automatic self-adjustment is effected by the pull of the belt on the movable pulley D, against the spring I. This is accomplished by placing the pulley D (which drives the feed shaft, G, through the gear wheels E and F) on an arm, M, centered on G. When the saw drives too hard or meets with an obstruction and greater stress comes upon the belt L, the arm M will be deflected to the right, compress the spring I, against which it bears, and bring the pulleys nearer together, loosening the belt and allowing it to slip. By the adjusting nut, J, the spring may be given a greater tension, and thus a stronger feed, depending on the power and what the saw will stand. This self-adjusting feed affects a great saving of time and obviates the danger of the saw being forced to its destruction. In cutting irregular shapes it feeds strongest when the resistance is least, i. e., the cross section is lightest.

The application of the power to the saw is shown in







Higley Saw and Slitting Machine.

fig. 2, the power being transmitted from the shaft *B* through the gear wheels *V* and *P* to the sprocket wheel *Q*, whose teeth engage in the saw *S* at *WW*, just underneath the bed and at the point where the saw does its work. The holes in which the sprocket wheel teeth engage are shown in fig. 1. This device for applying the power permits the use of a much smaller arbor or bushing, and therefore a deeper cut with the same saw. The saw is provided with wearing plates, *WW*, and a guard *V*, which hold it rigid and straight.

This application of power and the long travel of the saw give this machine a large capacity. It will cut or slot to a height of 9 in. above the bed and for 36 in. in length: it would therefore cut off an I-beam 30 in. high by 9-in. flange at one cut. The machine weighs 4,500 lbs., and will work effectively with 5 H. P. Fig. 4 shows the relative positions of the driving shaft and wheels and feed worm, also the guides *R* for the traveling saw carriage. It will be seen that they are securely protected, but readily accessible by lifting the bed plate.

#### Strike on the Lehigh Valley.

The brotherhood men on the Lehigh Valley road, who have been complaining of the conditions of their employment ever since the road separated from the Philadelphia & Reading, struck at 10 o'clock on Saturday night, Nov. 18, and nearly all of the freight trains and some of the passenger trains were "tied up." Engineers, firemen, conductors, brakemen and telegraph operators struck simultaneously and, according to the press dispatches, about 2,000 men stopped work. It is impossible to state with accuracy the seriousness of the strike, as the railroad officers claim that nearly all passenger trains are running in good shape and that freight is not entirely at a standstill, while the statements gathered by the reporters from the strikers indicate that matters are in very bad shape. They carry the idea that only one or two passenger trains a day are running on the main line; that those which do run are manned by green men and are several hours late. These statements are doubtless to be taken with a good deal of allowance, but admissions made here and there by officers indicate that the passenger business is conducted with difficulty. The principal lines of this road are almost wholly located near other railroads offering good facilities, so that the inconvenience to passengers is not so great as is generally the case in a strike of this size. At the present writing it looks as though the company had not made strenuous efforts to move freight trains, the aim evidently being to quietly make arrangements for new men and to attempt a resumption of freight business on Thursday or Friday. Press dispatches indicate that numbers of enginemen have started from points on the Chicago, Burlington & Quincy. On the other hand some employees left work on Tuesday who had resisted the appeals of the agitators up to that time. The stagnation of freight business, which, as we have just said, was almost complete on the main line between Jersey City and Buffalo, seems to have remained in about the same condition up to Wednesday morning. On Tuesday President Wilbur issued a bulletin warning employees to report for duty by Wednesday noon or to consider themselves discharged. This circular is as follows:

#### To All Employees:

To correct any misapprehension regarding the position of the officers of this company, I would state that they are at all times ready and willing to give patient hearing to complaints on the part of its employees or any number of them in any department. It is dissatisfied with the conclusions reached by the division superintendents or general superintendent, the president will hear their cases and decide. But we decline to confer with organized committees composed of the several branches of the service, for the reason that we cannot

know that such committee fairly represents its employees. The engineers cannot, of course, fairly represent the grievances of telegraphers, nor can firemen properly represent trainmen. The company maintain the right to employ men upon such terms as may be agreed upon, and settle all complaints only with its employees.

larger route for the products of the West. I understand that by the use of electricity the cost of transportation on the canals can be reduced three-quarters."

The cost of these experiments is estimated at \$5,000.

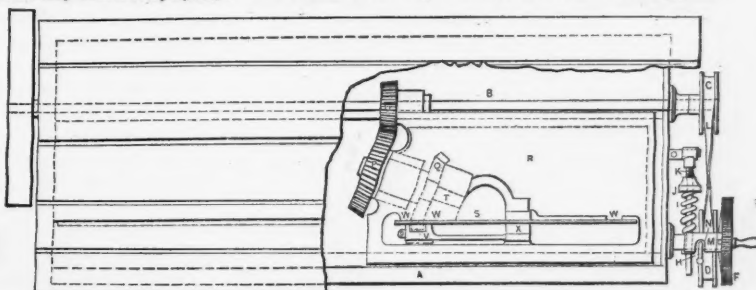


Fig. 2—Sectional Plan

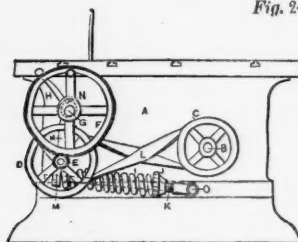


Fig. 3—End Elevation.

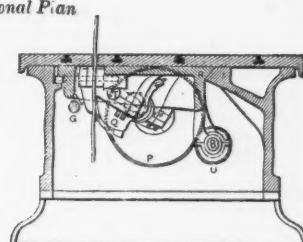


Fig. 4—Cross Section.

and to discharge for cause, with the right of appeal, but without reference to the judgment or action of any organization. All employees who may fail to report for duty on or before tomorrow, Wednesday, noon will be regarded as having left the service of the company, and all such will be paid in full as soon as the payrolls can be made up. Men failing to come forward and receive their wages will receive no consideration in reorganizing train service.

This strike is different from all railroad strikes in recent years in the fact that the enginemen struck simultaneously with the other employees in the train service. The only grievance of any consequence seems to be the refusal of the officers of the road to deal with the brotherhood committee. The efforts of the brotherhood chiefs for the last month or two have been devoted, according to their own statements, to getting the Lehigh Valley officers to carry out the terms of the agreement made with the employees by the officers of the Philadelphia & Reading when the latter company operated the Lehigh Valley. They have to deal with the same man, however, in both cases, as Vice-President Theodore Voorhees represented the Reading then and represents the Lehigh Valley now. He asserts that the terms of the Reading agreement are being carried out. But neither his statement nor those of the brotherhood chiefs, so far as published, give all the facts, and it is impossible to decide just how the controversy stands; but from all we can gather it would seem that the determination of Mr. Voorhees not to deal with committees had stiffened a little.

There was considerable intimidation at Wilkes Barre and Sayre and some at other places. Few actual conflicts were reported and those were slight, but the men who remained at work were evidently afraid to drive off the intruders. Cars were uncoupled and switches turned wrong, yet the accounts universally report "no violence offered." The road notified all the county sheriffs to be ready to repress lawlessness; and advertisements were issued, by the latter on Tuesday, asking for men to act as special deputies.

#### Electricity on the Erie Canal.

The long promised experiments with electric propulsion on the Erie Canal began at Rochester on Nov. 18. The Westinghouse Electric & Manufacturing Co. and the Niagara Falls Power Co. conducted the trials, and the first official run was made in the presence of the Governor of the State and many engineers and business men. The trolley system as generally applied on street railroads was employed except that for the return current a second overhead wire was strung, to which the return current was carried by a second trolley rod. These trolley rods were about 15 ft. long and carried an under running trolley, which permitted the boat to vary about 10 ft. from a straight course. In practice it is proposed to use an over-running trolley on a flexible wire which will allow more lateral movement for passing other boats. The boat was fitted with two 25 H. P. Westinghouse motors connected directly to the propeller shaft with the same company's series multiple controller. The current was taken from the Rochester Street Railroad Company's feed wire, which gave a voltage of 325 to 370, while the machinery should have had 500 volts.

The boat was an ordinary steam canal boat, 98 ft. long, and was loaded with 175 tons of sand and a large crowd of people. The experiment is considered to have been successful, the boat having made the trip from locks 65 to 63 at a speed of from 3½ to 6 miles an hour. The Governor, in a brief address, is reported as having said that "the canals now carry about 3,000,000 tons of freight a year. With electric motor power an assured fact, as it now seems it will be, we can carry 13,000,000 tons a year at no increased cost to the state. It will also open a

which leaves a considerable sum for further experiments, the state having appropriated \$10,000 for the investigation of the use of electricity on canal boats.

It may be added that the New York Tribune says that the boat was "pushed by two trolley poles instead of one as are ordinary street cars." That must have been written by the man who once spoke, in the Tribune, of turning the cranks to store electricity at the top of the poles in Madison Square.

#### The Ferris Wheel.

It was stated in these columns last week that the Ferris wheel continued to turn, but with empty cars. It has been decided that it is best to run it no longer, and the work of taking it apart began on Nov. 17. Just now the wheel company is being caused some inconvenience by a suit brought by W. D. Sommers, in the name of the Garden City Observation Company, for infringement of patent. The Ferris Wheel Company, however, claims that there is no infringement and that the suit causes only temporary inconvenience to the company. The suit was brought in the United States Circuit Court in Chicago, but has been transferred to Philadelphia. No verdict has yet been reached.

#### The Lake Street Elevated Railroad.

In our issue of Nov. 10 there was given an account of the opening of the Lake Street Elevated Railroad, Nov. 4, in Chicago. Although at this opening the trains carrying the invited guests were run as far as Homan avenue, yet the regular trains at first went only as far as California avenue, there being no station finished beyond. The stations at Kidzie and Homan avenue have now been finished and all trains run the full length of the road. On account of the numerous accidents recently on the West Side cable road, quite a number of its regular patrons now take the elevated in preference to having a long wait on the cable. The average number of people carried daily by the Elevated is 40,000. Twenty smoking cars have been ordered and the officers of the road expect to have them running soon. All the cars are lighted by the Pintsch gas system, having three lamps to a car. Up to the present date the cars are not heated owing to a delay in getting the apparatus in order.

#### The Metropolitan Elevated Bridge Over the Chicago River.

When the plans for the bridge to be built across Chicago River at Van Buren street, Chicago, by the Metropolitan Elevated Railroad were first presented, and permit for its construction requested, objections were raised by the officers of the West Side cable road and an attempt was made to prevent the elevated road crossing the river. The reasons given for the objections were that the foundations of the bridge would be so near the tunnel through which the cable company's line runs as to threaten the safety of the latter, and that the bridge would interfere with river traffic. The real reason was that the cable company wished to keep what it knows will be a strong competitor from crossing the river. The matter was referred to the United States Engineer officer at Chicago, Capt. W. L. Marshall, and by him to the Secretary of War. The Secretary has now rendered his decision in the case, and it is entirely in favor of the elevated road. The bridge that is to be constructed at this point was illustrated in the Railroad Gazette Oct. 20, 1893. One reason why the rocking bridge was decided upon was that Captain Marshall objected to a swing bridge with the necessary pier in the middle of the river to obstruct the river navigation; the rocking bridge gives a clear passage between the bridge piers. Now that permission is granted to build the bridge, work on it will begin at once.





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#### EDITORIAL ANNOUNCEMENTS

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The strike on the Lehigh Valley appears to be one of the most foolish on record. It has been ordered at a time when railroad business is dull, and many men are out of work; and, what is perhaps equally important to these strikers, when men in other skilled trades are also out of work, so that the newspapers will quickly grasp the situation, and will universally condemn the judgment of the leaders. It looks as though the brotherhood leaders, weary of the protracted dullness in their profession, had become so elated by the fact that five brotherhoods, including the enginemen, had come to an agreement, that they determined to strike "for a principle," regardless of consequences. It is, indeed, quite surprising that the enginemen, who have hitherto refused to join hands with the others (except so far as to get the fireman to aid them), should take this action; but from present indications the road will be able to cope with enginemen and trainmen combined, so that the coalition will fail.

It is probably as justifiable to strike on the simple question of methods of negotiation, as for higher wages or shorter hours. It often happens that the worst grievance an employee has is difficulty in dealing with his superior, and the worst existing grievance gets attention, even if it be a mild one as compared with the troubles of some other time or of some other men. But the question of principle is seldom clearly set forth, and so the contest is not clearly defined; and the present case appears to be no exception to the rule. The struggle is likely to be settled by might instead of by right, because the parties do not come to an agreement as to what the precise question of right is. Mr. Wilbur declines to recognize committees, because he cannot know whether they fairly represent employees. This is a strong point, and it holds good even if we leave out of consideration his objection to two or three brotherhoods coming to him together. It is the main ground on which every railroad manager can, if he chooses, refuse to deal with brotherhood chiefs. We have seldom, if ever, heard of a committee of employees coming with signed credentials from a fair number of employees. The aim of the brotherhood leaders seems to be always to get themselves recognized by the companies as brotherhood leaders. If hard pressed they will abandon this ground and claim nothing more than recognition as representatives of employees, but they do this only as a last resort, and when negotiations have got as far as this the employees are generally so stirred up that they do not feel like signing their names to credentials, and the leaders have to ask the railroad managers to take their word. Unfortunately, the leader's word is generally a little bit evasive, or his character is not well enough established to substantiate doubtful statements, and so the relations between railroads and their employees are in many respects no better now than they were 20 years ago.

If discontented employees have confidence in their leader why do they not give him full power to act for them? This power should be in plain terms and signed by every man. If it is feared that a signature

will mark the signer for dismissal or persecution let the whole body stand together by signing their names on a large sheet in concentric circles, so that no one or few can be picked out as leaders. We have heard of a manager who became incensed at receiving such a sheet, but we do not see that he had any just ground for such a feeling. If he were the sole manager of the road he might be pardoned for feeling personally affronted; but unless he could give assurance that all the men in the management were as just and considerate as himself, he could find no fault with employees for thus shielding themselves. A united front is an essential element in a fight which depends upon a large number of individuals. As Mr. Wilbur is willing to hear complaints from any number of employees he must, of course, recognize the principle of representation by committee. He cannot think of entering into personal discussion with every employee. But it is fair for him to demand that a committee of non-employees shall bring credentials from a considerable number of employees. If these committeemen were always well known men of established character it might, indeed, be wrong to refuse them a hearing, even if they represented but a few employees; but in any event a railroad manager can fairly be allowed to decide for himself how many factions among employees he will deal with.

In view of the prominence of railroad accidents in the public mind just now, it is fair that those roads which went through the World's Fair season without injuring their passengers should call attention to the fact; and a communication concerning one such road, not an unimportant one as regards mileage, appears in another column. There are, of course, other reasons for collisions than the mistakes of dispatchers and operators, but it is fair to say that the use of Rule 510 without the words "when practicable" is one of the reasons why roads using it thus do not have collisions. As we have before said, we advocate the space-interval system as the only adequate remedy for the collisions which occur under our ordinary methods, because it provides against a larger proportion of the dangers than any other remedy does, but it is only fair to give credit to a road which, like those named, uses the dispatching rules in their best form. The fatal carelessness in the Colehour case was of a kind which could have been indulged in under Rule 510 in its best form, but the requirement of the important additional safeguard referred to would have a tendency to strengthen the general stiffness of the dispatcher's mental apparatus and impress him with the importance of the fundamental rule "Safety first, celerity afterward." We would remind our correspondent, moreover, that his allusion to the "perfected code" is hardly *apropos*. In the first place, no perfection has been attempted in the code except in language. A number of rules are presented in alternative form; one road adopts one form and another the other. The responsibility is upon each road to adopt that which is safe for its own circumstances. A prominent merit of Rule 510, as a part of a code, is that it can be adapted to two different plans of making meeting points, by the retention or the expunging of only those two words "when practicable." Uniformity is promoted by thus deterring individual roads from trying to improve the language by making alterations, and general clearness and simplicity are promoted by this or any means which induces managers to use the work of a careful and competent committee, instead of depending upon their own unaided talents. This is all that can be expected from a code whose chief aim is uniformity. Precepts are not practice. And, as we have said, even a perfect code can be disobeyed.

The M. C. B. Committee on Ventilation of Passenger Equipment has sent out a circular stating that it is very anxious to make that part of its reports which bears on past experiments and present practice a thorough one in order that in its recommendations it may profit by past failure and success. It urges therefore that all members should answer the questions submitted, fully and promptly. Mr. R. P. C. Sanderson, Division Superintendent of Motive Power, Norfolk & Western Railroad, Roanoke, Va., is the Chairman of the Committee, and to him replies should be addressed. Thirteen questions are asked, and the Committee asks information as to plans or devices not covered by its questions. Surely this matter which has been for years bothering mechanical and transportation officers, and in which but very little progress has been made, deserves the best attention of railroad officers, for great improvement may be made in practice. But we have long been of the opinion that the greatest obstacle to improvement is in the ignorance or indifference, or both, of the passengers themselves. In any

given train load of passengers there will always be some who are afraid of any suspicion of fresh air, and who will rise up against the opening of whatever apertures may be contrived for admitting fresh air or exhausting foul air; and the protests of one or two such persons in one car will generally be sufficient to overrule the wishes of those who want better ventilation. This being so, the lot of the trainman in charge of the car becomes particularly hard, and it is not surprising that he should take the safe course of promptly closing every aperture at the first complaint. So, while it is not difficult to keep a car fresh by proper manipulation of the sashes in the clear stories and in the doors, general instructions for the management of these soon fall into dead letters. The irrepressible conflict between those who fear drafts and those who do not wish to die of asphyxiation is too much for the average trainman, and he soon concludes to let the whole thing go by default. But it is not likely that the people who travel will very soon be educated to the point of knowing whether they are breathing fresh or foul air, and so it remains with the railroad companies to contrive some means of making them breathe fresh air involuntarily. The problem before the inventor is to insinuate fresh air in such a way that nobody will know that it is coming in, and to exhaust foul air by concealed passages. But until this ideal method of ventilation is perfected a good deal can be done by operating officers in steadily following up the trainmen with rules and verbal instructions, requiring them to vigilantly regulate the temperature in the cars and to systematically open the sashes which are provided for exhausting foul air. After all, very simple contrivances will answer if they are managed by intelligent men; so it would appear that what we want first is not more mechanical apparatus, but more schools of ventilation.

PORTSMOUTH, N. H., Nov. 18.—Early this morning a gang of tramps held up freight train No. 25 at Butler's Crossing, on the Boston & Maine, by means of false signals. Three of them held the rear brakeman and another broke the seals of three Maine Central freight cars. When the westbound freight came along the railroad men signaled it, and the forces of the two trains, after a battle with the tramps, routed them, one of them being badly injured.

PORTSMOUTH, N. H., Nov. 20.—A second attempt within 24 hours to hold up a freight train by tramps occurred on the Boston & Maine near here yesterday. Freight train No. 294 was stopped just outside the city limits by a force of tramps armed with clubs and stones, who made a savage assault upon the trainmen. The latter were driven into the caboose, where they were held close prisoners for nearly an hour. The tramps were only driven away by the timely arrival of a second train. None of the tramps was captured. To-day orders were issued by the road for the trainmen in that section to carry arms.

These are but samples of items which now appear every few days. They show a truly remarkable state of things. Fancy a huckster driving out of the city of Portsmouth "held up" by highwaymen; or a farmer in New Jersey, within five miles of New York, attacked, beaten and half killed by footpads! We should at once be told that communities in which such things could happen are not civilized. But how is the case different when a railroad train is attacked and the trainmen forced to fight for the protection of the property in their charge, and perhaps for their lives? It is not different in kind, but only in degree. It is worse in the amount of property and number of lives imperiled and in the public inconvenience. So far it is much worse, but in principle it is the same. It is a disgrace to our whole country; and the communities in which it happens are, so far, barbaric. They have no business to call themselves civilized. What is the remedy? It is proper, of course, that the trainmen should be armed, and it is a pity that there were not in the engine cabs and the cabooses of those trains that were attacked a good stock of Winchester shotguns with buckshot cartridges and that a dozen tramps were not killed. But that cannot be the permanent or normal way of protecting trains, any more than lynching can be the enlightened way of stopping rape in the South. It is a barbaric way of meeting a barbaric condition. In a civilized country a railroad company has no more need to defend by arms the goods of its patrons than has a warehouse company; and while a resort to arms may be right and necessary it can only be demoralizing. It destroys the respect for law in the minds of those who do it and those who see it done. The states and counties and cities themselves, through their constables and their courts, must protect the railroads as well as the hucksters and the farmers. When the counties fail, after due notice and warning, to protect railroad property, the railroad companies should sue for damages and make it costly for the counties not to protect them. When the thrifty Yankee taxpayers see that they must pay out of their own pockets for the frolics of tramps and toughs those frolics will come to a sudden end.



## Normal Danger or Normal Clear?

It has long been a fundamental principle in signaling that the normal position of a signal should be at danger; that is, that it should stand at danger always, except when cleared by the positive use of some force, acting for a short time and for a specific and definitely limited purpose; and that this specific purpose being fulfilled the signal should again go to danger. The root idea is that the clear signal must be positive, for the absence of any signal or the absence of actual intention to give a signal should be taken as a danger signal. The danger signal may be either positive or negative, but the clear signal must always be positive. This principle is accepted, we believe, by all specialists in signaling, and by all operating officers who have thought enough about the subject to reduce their ideas to principles, for interlocking and for all forms of manual blocking. But automatic block signaling introduces other conditions and has led to the doctrine, held by some, that automatic block signals should stand normally at clear and be set to danger only when the block is actually occupied, or the track interrupted in some way, or the signal out of order. This doctrine has been put into practice very generally where automatic block signals are used. It may be well therefore to inquire into the subject and see if the fundamental principle does not still hold good with automatic block signals. To that end we shall endeavor to sum up the arguments for the normal position at clear and for the normal position at danger.

The first and most important reason for the normal clear system is economy and simplicity of installation. In electric signals the normal danger system requires additional relays and circuits. This complication becomes still greater if distant signals are used, as they must be, sooner or later, where fast trains are run. To this it is replied that the additional parts are few and simple, and that there is an economy in battery material from the fact that with the normal danger system the local circuit is closed only while the signal is held clear—that is, for but a short time as compared with the time that the circuit is closed on the normal clear system. Obviously this is a relative matter. On a road with long blocks and infrequent trains this economy would be proportionately greater than on a road with short blocks and many trains. That is, the greater or less cost of one or the other system, and the difference of cost is a special problem in each case. It is not a fundamental or general matter.

It is held that on roads with long stretches of straight and level track the signals will be visible for considerable distances, or even more than one block signal may be visible at once, and that the engineman, seeing the signals at danger, will slacken speed and lose time. It is replied that in an intelligently arranged system of block signals the signals are so placed that the engineman gets timely warning and stops, or begins to stop, at a certain point with regard to the signal. The signals are, or ought to be, placed with consideration of grades, speeds, backgrounds, curves and other local conditions, and there is no reason why an engineman should be expected to slacken speed the moment he comes in sight of a signal at danger. In fact, this argument would apply against using the normal danger position for manual block signals or for interlocking, if it were sound. And here comes in another point. In order that the engineman may know that the signals are operating, the signal, when the normal position is clear, must go to danger before he reaches it. The fact that he sees it go to danger indicates that it is in operating order. But why may it not indicate that something has happened just at that instant to make it wrong for him to enter the block? Why should he be instructed in this special instance to violate the law of signaling and run past a danger signal? On the other hand, if the normal position of the signal is at danger it can be arranged so as to be cleared as the train approaches it; then the engineman will know that it is in order and he will also run under a clear signal instead of a danger signal.

Another argument that we have heard is that with the signals set to go to danger when the block is occupied they are essentially in the normal danger position. This seems to be whipping the devil around the stump, for by the very definitions a signal worked on the normal danger idea stands at danger always when there is not an immediate and actual occasion to get a reading from it. When that occasion arises it is cleared if the way ahead is safe, otherwise it is not.

On the other hand, the arguments for making danger the normal indication are that errors and failures are all then on the side of safety. If a signal freezes it freezes to danger; if it sticks it sticks to danger. If an engineman is careless in reading a signal it is more

likely that he would make an error in watching signals normally at clear. It is likely that the attitude of a man's mind would be more careless if he passed a succession of clear signals which did not move than if he passed a succession of signals standing at danger, each one of which was obliged to move to clear as he approached it, in order that he might go on. In other words, the normal danger position is the one most likely to educate the engineman in vigilance. The soundness of this view is attested by the wide use of the rule that train order signals shall be pulled to the all-clear position after the approaching train comes in sight.

Finally, the old point of uniformity in practice comes up. This may be less important than many people think, or it may be more important. At any rate, it is worth something, and whatever value it has, it is on the side of the system of operating signals normally at danger.

This, we believe, is a fair and comprehensive summary of the arguments for and against the two systems. We do not give it as complete or conclusive, but that the reader who is unfamiliar with the subject may have a starting point to reason from. We have long held and preached the fundamental principle that the normal position of all signals should be at danger, and we have held that any other belief or practice is heresy. So far we have learned nothing to cause us to depart from this doctrine.

## The Air-Brake Decision.

A decision in the three suits of the Westinghouse Air Brake Company against the New York Air Brake Company, for infringement of patents covering the quick action air-brake system, was handed down by Judge Townsend, of the United States Circuit Court, at New York, on Monday of this week. These suits were all argued at the same time, in January last, and we published at the time a synopsis of the case as presented both by the complainants and the defendants.

The apparatus of the New York Air Brake Co. in suit was its engineer's brake valve, and both its early and late forms of quick-action triple valve. It was claimed by the complainants that the New York engineer's brake valve infringes a patent for an engineer's valve issued to George Westinghouse, Jr.; that the early form of triple valve of the New York Co. infringes patent No. 393,784, issued to Harvey S. Park, and subsequently assigned to the Westinghouse Air Brake Co., and that it also infringes patents No. 376,837 and No. 448,827, issued to George Westinghouse, Jr., and that the more recent construction of the New York triple valve infringes the last two of these patents. It should be explained that patent No. 376,837 is the second in order in which the quick action patents were taken out by Mr. Westinghouse, and covers the form of construction used in the standard Westinghouse triple valve which is now in general service. The patent No. 448,827 is one of a later date and was a result of a division of patent No. 376,837. It broadly covers that class of quick acting valve mechanism which operates, independently of the action of the triple valve, exclusively by a rapid reduction of trainpipe pressure.

Judge Townsend's decision sustains the Westinghouse company in each of these claims, except in the case of the Harvey Park patent and one or two unimportant details of construction; that is, the New York engineer's valve is an infringement, and each form of the quick-action triple valve of the New York company is declared to infringe the broad claims of both of the Westinghouse quick action patents mentioned, and a decree is entered for an injunction and accounting for damages in every case.

The opinion accompanying this decision is very voluminous, and we have not yet had an opportunity to ascertain the grounds upon which the decision of the various points is based; but, as the Park patent was taken out at a later date than the Westinghouse patents it is reasonable to infer that Judge Townsend decides that the Park patent is itself subject to the Westinghouse patents, in dismissing that claim.

The effect of this decision must be very far reaching in its definition of the rights of the Westinghouse Air Brake Co. The claims of the Westinghouse patents which are sustained are fundamental and very broad. The contention of the defendants was that the claims of these patents must be narrowly construed to apply only to the actual constructions shown and described in the patents; in the earliest patent taken out for the quick-action air-brake, the claims, it was contended, were not sufficiently broad to cover the later devices.

In the case of the patent No. 448,827 the defense admitted the infringement, but denied the validity of the claims. The decision of Judge Townsend establishes the validity and full scope of the broad claims of both of the patents, and thus establishes the exclusive title of the Westinghouse Air Brake Co. to the quick-action air-brake system.

By those who are acquainted with the course of events which led to the invention of the quick-action air-brake,

the justice of this decision will not be questioned. That Mr. Westinghouse invented an entirely new and highly useful process in the application of air-brakes to railroad trains cannot be disputed, and, although it is possible that, in the application for his original patent, the far reaching character of the invention may not have been fully realized, his diligence in following up that invention by perfecting it and applying for patents for each of the other possible methods for obtaining the same result, before any of them had occurred to anyone else, should certainly entitle him to all the advantages which he might simply have claimed in his earliest patent, without even showing the improved methods for realizing them.

The gist of the matter appears to be, therefore, that, inasmuch as at the present day the superiority of the quick action air-brake renders it indispensable to modern railroad service, the Westinghouse Air Brake Co. will exclusively furnish our railroads with their air-brake apparatus. We believe that, upon careful and mature consideration, it will appear that this condition will ultimately prove to be of benefit to the railroads.

While the stimulating effects of competition in any business are to be regarded as advantageous to the public, the use of air-brakes, especially in freight service, gives such weight to other considerations that competition seems to assume a position of lesser importance. Of all the different classes of equipment for railroad cars which are interchanged and hauled by roads all over the country, there is none which can be classed with the air-brake in the importance of strict uniformity and interchangeability of parts. In the case of the automatic car coupler, for instance, it is simply essential that couplers upon different cars shall be so constructed that they will properly couple together, and the special forms and details of construction, beyond this requirement, are comparatively unimportant. With the air-brake this is wholly different. It is not merely essential that the apparatus of one car may be coupled to communicate with the apparatus of each other car, but also that the functions of the brakes upon all cars in the train shall be the same, and that the operation of the apparatus of each car shall be identical and simultaneous with the operation of the apparatus upon each other car. It is requisite, also, that the effects of continuous service shall not seriously impair this uniformity of action. The tests of the operation of air-brakes of different makers, where two or more kinds of brakes are mixed in one train, have, so far as we have been able to learn, uniformly exposed the danger to be feared from the intermixture, in railroad trains, of brakes manufactured by different companies. The tests of the Westinghouse and New York brakes upon the New York Central, a year ago this fall, demonstrated the correctness of this belief beyond any reasonable dispute, and we so pointed out in our subsequent comment upon these tests.

The great care exercised by the Westinghouse Air Brake Co., in the manufacture of all the details of its apparatus, warrants the belief that the apparatus furnished by it will be of such a uniform workmanship, perfect interchangeability and identical operation, as could never be realized if more than one company were supplying it. The recent law passed by the National Government and by state legislatures, with regard to the equipment of all freight rolling stock with uniform power brakes, also suggests the great disadvantage and enormous expense which would be entailed upon railroads throughout the country if each were required to carry in stock the necessary detail repair parts of several or even for two, different systems of air-brake apparatus.

It is impossible to ignore the fact that the present state of perfection of the air-brake system is wholly due to the efforts and ingenuity of Mr. Westinghouse and the Westinghouse Air Brake Co. The development of the air-brake from its earliest to its latest form has been one of steady progress, as the changing conditions of railroad service have required. This development has been the outgrowth of continued exertion and study on the part of the Westinghouse company, and is due, in no degree, to competition. Such competition has followed the lines already trodden by the Westinghouse company, and has resulted only in the production of inferior apparatus. It is fair to presume that the Westinghouse company will be in the future, as it has been in the past, alive to the needs of the times, and with its past experience to guide it, keep pace with future requirements. Up to the present time more than 95 per cent. of all the air-brake apparatus applied to railroad cars in this country has been supplied by the Westinghouse company, and we feel that the railroads throughout the country should be congratulated upon the fact that they may now proceed with the equipment of their freight rolling stock with air-brakes with a feeling of security against the troubles and annoyances, not to say disasters, which have been threatened while the possibility of the introduction of inferior and discordant apparatus was impending.

## The Railroads in Wall Street.

Money in any sum within reason can be obtained on mixed stock and bond collateral for four months at 3 per cent. The statement of the Associated Banks of



New York made last Saturday shows unmistakably that the tendency of money at the present time is toward inactivity. This is not, as is popularly believed, because of any distrust on the part of capitalists, but through a lack of demand. It indicates clearly a most unprecedented business stagnation. The surplus reserve, according to this statement, was \$181,641,500, of which amount \$65,470,475 was in excess of legal requirements. This is the largest excess on record, and, more notable still, the figures were recorded in three months after the height of the panic was reached. In 1885, fifteen months after the panic of May, 1884, the surplus reserve was \$64,724,100. The 1893 panic was much more severe than that of 1884; nevertheless the money returned to the banks in one-fifth of the time. The piling up of capital in banks, according to history, is one of the first signs of a recovery. In view of this fact the rapidity with which money has returned is significant, as it shows that the liquidation has not only been complete, but rapid. It shows, moreover, that the causes were not deep seated, and gives color to the repeated assertions that the panic was based largely upon sentiment; that it was almost unprecedented in the history of finance; that it was nothing more or less than a distrust of credit.

After the 1884 panic the market showed an appreciable permanent advance in values before the banks showed their large gains in reserves; a similar market advance has not taken place this year. A rally after a panic is inevitable; when it comes it will be strengthened by the vast sums of capital seeking investment. As was the case late in 1885, the first signs of a revival of business activity will be a decrease in surplus reserve and a decided increase in loans. The relation between these two items is the industrial barometer.

The stock market of the past few weeks has been too purely professional in character to be an indication of the real condition of affairs in the railroad world. The bears started in to sell it short after the repeal of the Sherman silver law. Meeting with little resistance they have been aggressive up to a very recent date. On Monday of this week signs of a revival of interest among local capitalists, as well as a London inquiry, turned the tables somewhat, and caused a general covering of shorts. This attitude has undoubtedly been influenced by a very strong inquiry that is being made for the best class of railroad bonds. Those who have large sums lying idle realize that they have plenty of company, and also that this money must eventually be made to earn interest. They have been carefully watching for the turn in industrial affairs, and on the whole have manifested their intention to enter the market on the turn and not after it is well under way. We hear some very optimistic talk just now of the demand which will be made for gilt edge securities. One prominent commission-house has been recorded as saying that the next four months will be a record breaker for prices. This authority believes that as those securities of the better class are absorbed, those of second and third rating will come in for substantial advances. All this will make an excellent market for new securities. In the rise of Tuesday and Wednesday of this week, it was a noteworthy fact that those stocks which scored the greatest advances were those in which there was the greatest short interest. The Western railroad situation from a Wall street standpoint has made a turn and is now making a small but nevertheless steady improvement. The roads of the middle west and the east are harmonious on rates—a most unusual thing when earnings are light; they have introduced economies heretofore unthought of; the earnings have reached the lowest point and made the turn, and what is more important to Wall Street than all else, their present condition has been fully discounted in the prices of their securities.

Ali along there has been a fear that the worst was not over and that the next unfavorable development would be a reduction of dividends by a number of prominent roads. It was thought three weeks ago that Burlington would reduce dividends from 1½ per cent. quarterly to 1 per cent. quarterly, and there were many who believed that the Omaha 3½ per cent. semi-annual on the preferred stock would be reduced to 3 per cent. These full dividends were declared and, in addition, full dividends on Northwestern common and preferred. This action of the various managements has done much to restore confidence. Viewed broadly, we may believe that the turn in railroad affairs has been made, and although the improvement may be slow for some time to come, it will be healthy.

#### The Speed of the Columbia.

If the reports of the official trial of the Columbia be verified by the official reports of the Trial Board (which have not yet been made public), the United States Navy has the swiftest warship afloat. Careful computations by experts and officers on board give the Columbia an average record of 22.81 knots (26.27 miles) per hour for a distance of 87.94 knots (101.26 miles) and a record of 25.31 knots (29.14 miles) per hour for a distance of 7.74 knots (8.91 miles). The latter rate is phenomenal; and doubts have been freely expressed about it. A study of the following table of the run and a comparison of the dis-

tances and time elapsed will give some grounds for doubt.

#### Going north:

Station vessel.	Distance in nautical miles.	Elapsed time.	Speed in knots.
Dolphin.....	2.37	6.18	22.65
Iwana.....	6.66	15.04	22.11
Kearsarge.....	6.66	17.18	23.10
Leyden.....	6.4	16.16	23.55
Narkeeta.....	6.4	17.16	22.22
Fortuna.....	7.74	21.36	21.53
Vesuvius.....	7.74	18.19	25.31

Elapsed time—1 hr. 55 min. 7 sec., to cover a distance of 43.97 knots, an average of 22.92 knots.

#### Going south:

Station vessel.	Distance in nautical miles.	Elapsed time.	Speed in knots.
Vesuvius.....	7.74	18.45	24.77
Fortuna.....	7.74	22.00	21.11
Narkeeta.....	7.74	17.45	21.63
Fern.....	6.4	16.11	23.77
Leyden.....	6.4	17.24	22.96
Kearsarge.....	6.66	17.53	22.71
Iwana.....	6.66	16.17	22.70
Dolphin.....	2.37	6.17	22.70

Elapsed time—1 hr. 55 min. 17 sec., to cover a distance of 43.97 knots, an average of 22.7 knots.

The rate for the distance between the boats Narkeeta and Fortuna is given at 21.53, and that between Fortuna and Vesuvius was 25.31 knots, and on the return trip the table shows rates over these same courses of 24.77 and 21.11 knots per hour. The ratio of these rates both ways is the same, viz., as 1 to .85, which arouses a suspicion, at least, that the boat Fortuna had drifted toward the Vesuvius, or had not been placed at the proper distance. The rates between other stake boats of the course are very uniform, except on the return trip between the Fortuna and the Fern, where the decreased speed is admitted and explained, but no explanation whatever is offered of the slow speed between the Narkeeta and the Fortuna on the run north, except that the water was not so deep. The officers who placed the buoys are said to have expressed confidence in their location, and the record of 25.3 knots will very likely stand until a certainty of error has been discovered.

A comparison of the steam pressures and screw revolutions also indicates that there was a mistake. At the Leyden buoy the steam pressure was 152 lbs., and the revolutions of the screws 135, 134 and 129, giving a speed of 23.10 knots, while when the great record of 25.31 knots was made the steam pressure reported was 158 lbs., and the revolutions of the screws 136, 136 and 131. This difference and the extra depth of water could never account for the difference of speed reported. On the return trip over this same stretch the steam was 160 lbs. pressure, and the revolutions 136, 136 and 130, giving a speed of 24.77 knots. Under practically the same steam pressure, and with the same number of revolutions of the screws, we have reported a velocity of 25.31 knots against an average of about 22½ knots on other parts of the course.

Taking the distance from Narkeeta to the Vesuvius, a distance of 15.48 knots, it was made on the northward run at an average speed of 23.48 knots an hour, and on the return trip at a speed of 23.22 knots an hour, or an average speed, for the whole distance, of 30.96 knots, of 23.22 knots (26.74 miles) an hour. This rate of speed is unprecedented even for short distances, and still leaves the Columbia the queen of all warships.

On her preliminary trial the Columbia is credited with having developed a speed of 24.95 knots while running between the same buoys where she made her fast time on the official trip, and the buoys may have been out of place then. On her official trial the day was fair with a light breeze, which was little, if any, disadvantage to her. She carried on an average 155 lbs. of steam, and the maximum numbers of revolution of her screws were 138 on the port and starboard engines and 132 on the aft screw.

Picked Pocahontas coal was burned and her decks were cleared of everything that offered resistance to the air. She is reported as having developed 21,000 H. P., and that 264 men were employed below the water line in the engine and fire rooms. There were about 20 oilers in each engine-room. Some 30 tons of coal were burned an hour and she used about 20 barrels of oil on the trip for lubrication.

The Columbia is 412 ft. long and 7,700 tons displacement and she can steam completely around the world without touching at any point for coal, and when occasion demands it she can overtake the swiftest merchant vessels. She has three screws, one on each side, and one aft in the middle. There are but two other triple screw steamships of any size in the world. One the French man-of-war Dupuy-de-Lôme, and the other the German Kaiserin Augusta. The latter has made the better time of the two, 22 knots an hour, but they are under 5,000 tons in size. The contract price is \$3,000,000, and a bonus of \$50,000 for every quarter of a minute that her speed exceeded 21 knots an hour; which gives to the Cramps of Philadelphia, the contractors, \$350,000.

It was stated in these columns Nov. 10 that the Illinois Central had replaced its World's Fair express trains, which were run from Van Buren street to Jackson Park, and which were made up of special cars for the service, with suburban express trains running to Sixty-third street and made up of regular suburban cars. It was shown that at Sixty-third street the Illinois Central met with the strong competition of the South Side elevated road, and south from this point to South Chicago and Kensington, with strong competition from

the combination of the elevated and the Calumet Electric Street Railway, the latter operating 54 miles of track south of Sixty-fourth street. That the Illinois Central is fully aware of the condition of affairs and intends to take such steps as are necessary to win back traffic that has been diverted from its line is proved by the action taken during the last week. On Nov. 22 a reduction was made in the rates from Van Buren street to South Chicago, Pullman, Harvey, Homewood and intermediate stations; stations for the Sixty-third street express trains have been built at Fifty-third and Fifty-seventh streets; and in the course of a few weeks the express service will be extended to Grand Crossing. The fare on these trains will be 10 cents between any of the stations, and commutation tickets will be accepted and punched at the gates. This is a reduction of about 18 cents in the former one-way rate to Grand Crossing and a smaller reduction from the other stations. The reductions from the one-fare rate to the other stations named are: South Chicago, from 36 cents to 17 cents; Pullman, from 40 cents to 17 cents; Harvey, from 50 cents to 22 cents, and Homewood, from 70 cents to 23 cents. The new rates being those formerly given when ten-ride tickets were purchased such tickets are now dispensed with and but one rate is given. Of course it is expected that the express train service, which will be run between 7 a. m. and 7 p. m., will hold most of the traffic originating between Grand Crossing and Fifty-third street, and that the giving of the ten-ride rate for single passages will hold most of the traffic between the city and the extreme points. Such arrangements will have a tendency to produce the desired results, especially during the winter when the transfers necessary by the electric line are disagreeable; but the Illinois Central will find it necessary to make further concessions if it would hold its large suburban business. A large majority of the people of South Chicago, Pullman and other towns in that section are of the laboring class who live near their work, and when they visit the city the saving of a few cents in car fare is much more to them than the saving of a few minutes in the time necessary to make the trip. It is this larger number, then, the Illinois Central can hope to carry only at a rate little, if any, above that by the somewhat slower lines. Single trip tickets only being in use, they will be limited to the day on which sold, and the day of the year will be punched into each ticket.

The scheme of the North River Bridge Company (the Lindenthal bridge as distinguished from the New York & New Jersey, Mr. T. C. Clarke's bridge) to secure funds to carry out its construction has been declared by the Supreme Court of New York to be a lottery and therefore illegal. The suit was brought by J. K. McKenahan against J. L. Mott *et al.* for an injunction to restrain the carrying out of a proposed scheme for the redemption of bonds at maturity value; the bonds redeemed to be determined by lot, i. e. by a chance drawing. The company proposed to issue bonds for a sum not exceeding \$100,000,000, to be issued in denominations of \$100, and bearing interest at six per cent., maturing in July, 2343, or 450 years hence. These bonds were to be secured by a first mortgage or deed of trust on the company's property and franchises. A sinking fund of \$400,000 was to be maintained, and out of this certain of the bonds, to be determined by lot, were to be redeemed and paid at their maturity value. The plan contemplated paying to those lucky persons whose numbers were drawn the principal (\$100) and compound interest at two per cent. for 450 years, making \$1,000. In other words one man by investing \$100 might, by mere chance, get in six months \$1,000, while another might not realize upon his investment in 450 years. The Court says of the scheme that "the scheme is a lottery. That to the mere decision of a chance is to be left what bonds shall be retired at the enormous increase contemplated is as plain as if the loudest proclamation were made of it. It is the chance of winning at an early drawing 10 times the face value of a bond that constitutes the illegality, if there is any illegality in the scheme." Judgment was given to the complainant for the relief sought, with costs.

The report of the Executive Committee of the American Railway Association, which was presented at the October meeting and appears in the report of the proceedings, just issued, refers to the fact that standard time, according to the system devised by Secretary Allen, and adopted by the Time Convention in October, 1883, has now been in use 10 years. "It has now stood the test of practical experience for 10 years, and no inducement that could be offered would persuade our people to return to the old system of using local time." The report gives the following summary of the present conditions in other countries in the matter of standard time:

"But not only in this country has this reform been effected. Greenwich time, six hours faster than our Central time, is used by the railways of Great Britain, Belgium and Holland, and it is the legal time for all purposes in Great Britain and Belgium. Middle European time, one hour faster than Greenwich time, is used by the railways in Sweden, Germany, Hungary, Serbia and the westward part of Turkey. It is the legal time for all purposes in Sweden and the German Empire, and is likely to be adopted at an early date by the railways of Italy and Switzerland. Eastern European time, two hours faster than Greenwich time, is used by the railways of Eastern Turkey, Bulgaria and Roumania. The time of the 135th deg. of east longitude, nine hours



faster than Greenwich time, is used for all purposes in Japan. It appears probable, therefore, that the reform movement in time-keeping, which through the action of this Association was first put into practical effect in this country 10 years ago, before another 10 years will have passed will have been adopted by all the railways, and possibly by the civilized inhabitants, of the whole world."

The Railroad Commissioners of Illinois have given the newspapers some plain talk concerning shabby railroad tracks in that state. Commissioner Lape has made a special report relative to the condition of several roads examined by him during the past two weeks. He suggests that the Cleveland, Cincinnati, Chicago & St. Louis and Louisville & Nashville be requested to build a new depot at Carmi, and that the attention of the State Board of Health be called to the present depot, which "is in a shockingly filthy and crowded condition." The joint track of the Peoria, Decatur & Evansville and the Terre Haute & Peoria, from their connection with the Illinois Central, "is in a dangerous condition and the bridges are unsafe." The reduction of the speed of passenger trains to 15 miles an hour and of freight trains to eight miles per hour on this track is recommended for the present. It is recommended that the Receiver of the Jacksonville Southeastern be required to place new steel rails and 500 ties per mile upon the Springfield & Havana branch, and that if this be not done within 90 days the road be closed to traffic. The condition of the bridges and trestle works on the St. Louis & Chicago road between Springfield and Litchfield is reported bad, and it is recommended that the General Manager be requested to place new stringers upon all bridges and trestle works within 60 days. The whole extent of bridges and trestles needing new stringers is about 7,000 lineal feet. Five hundred new ties per mile are also needed on this line.

The special high speed locomotive "Columbia," exhibited by the Baldwin Locomotive Works at the Columbian Exposition, will not be returned east for several weeks. It will be put in service on the St. Paul road for the purpose of finding if engines of such type are suited for the conditions met with in the West. This locomotive was described and illustrated in the May 26 issue of this journal. It has the Vaucain compound cylinders, driving wheels  $8\frac{1}{4}$  in. in diameter, a leading and a trailing two-wheel truck with wheels  $5\frac{1}{4}$  in. in diameter. It differs materially from the passenger engines at present used in the West. The "Columbia" attracted considerable attention from visitors at the Fair. The builders of the "James Toleman," who challenged the American builders to a locomotive test, as stated in the *Railroad Gazette* of Nov. 3, were particularly desirous of a trial against the "Columbia," because they claim for the "James Toleman" that, with the high pressure of the steam used, the expansion obtained in the cylinders and the large driving wheels, it will give as good results in the economical use of steam, speed and load hauled as any type of compound locomotive at present in use. The "James Toleman" will probably leave Jackson Park under steam, but its destination has not yet been decided. Railroad men, and especially those of the West, will watch with much interest the trial of the "Columbia" in Western service.

The Grade Crossing Commission at Buffalo has finally agreed upon a plan of changes in grade for the street crossings at the worst points on the principal roads in that city, and has filed a report, embodying the plans, with the County Clerk. This action is supposed to mark definite progress in this long-pending controversy. After many changes and failures, a law was finally passed giving the Commission power to make this final plan and to report it to the County Clerk, with evidence that the interests of the railroads had been duly considered; and, on this being done, the Commission is empowered to use compulsion in the case of any road failing to comply with its orders. The Commission will now endeavor to complete arrangements with the railroads so as to begin work early in 1894. A sketch plan of the city showing the proposed changes of grade was shown in the *Railroad Gazette* of May 6, 1892, in connection with an article by Mr. E. B. Guthrie. The changes since agreed upon by the Commission do not, as we understand it, vary the main features of this plan materially. The principal differences are in width and height of openings.

It appears that the steel rail situation has made a little progress toward settling down since we last wrote. We are told that the mills of the Maryland and the Pennsylvania Steel companies have been leased by the other five works in the Association, and that the Maryland mill will be closed. The Association price is to be fixed at \$24. Notwithstanding the stout denials made by agents of the Eastern mills, rails were probably being offered at those mills at \$21 f. o. b. before this price was announced.

#### NEW PUBLICATIONS.

The *Yale Review*, which heretofore has been published by Messrs. Ginn & Co., now bears the imprint of Messrs. Tuttle, Morehouse & Taylor, of New Haven, Conn. This is a quarterly "journal of history and political science," edited by a board of five, all professors in Yale University. The November issue is No. 3 of Vol. II., the

first issue having been May, 1892. The *Review* has the usual variety of papers found in quarterlies of this class, with the difference that they are a little more sprightly as a rule, and it has besides a very interesting feature in its short editorial comments on questions of the hour. These are examples of high class editorial writing on matters of human interest.

#### TRADE CATALOGUES.

*The Westinghouse Engines.*—The Westinghouse Machine Company, Pittsburgh, Pa.

This catalogue is fresh from the press of Bartlett & Co., New York, and is a beautiful specimen of art and ingenuity. It is 7 in. x 9 in., 112 pages, printed in sepia, the cuts in black. It includes chapters on the following subjects: Why Westinghouse engines are built; why they are single acting; why they are self-lubricating; why vertical and self-contained; general description of all their engines; details of parts; balanced piston valves; piston leakage; the testing room; repairs; crank case oil; which engine to select; objections to their engines; commercial economy; principles of compounding; uniform duty under varying loads; standard performance of engines; what is good regulation; the inertia governor; subdivided power; relay steam power; business methods; twelve years of experience; tables of sizes, powers, etc. The book is elaborately illustrated with perspective engravings of the company's works, offices and engines. The last are shown in perspective and in section. In many cuts the exterior parts are shown in transparencies, so that the interior working parts may be seen in their correct position with reference to them. This is a very clear and pleasing way to present complicated machinery and is now quite common, although it was original with this company. The detailed parts of engines are also shown and described.

*Ice Making and Refrigeration* is a catalogue recently issued by the same company. It is 9 in. x 12 in., 24 pages, and describes the processes patented by Messrs. Hodges and Havenstrite. The book illustrates the machine as a whole and in detail, and these engravings are accompanied by carefully prepared reading matter. A list of compressors is given whose capacity for refrigeration ranges from 1,500 to 1,000,000 cu. ft.

#### TECHNICAL.

##### Manufacturing and Business.

The Toledo Bridge Company is building a large freight shed in Cincinnati for the Cincinnati, Hamilton & Dayton road, using Wilson's rolling steel shutters for the walls. This method of construction admits of developing all sides of the structure and greatly facilitates the freight handling. The Chicago & Grand Trunk has completed a similar freight house in Chicago, and Mr. Wilson is furnishing the rolling shutters for the great shed of the American Sugar Refining Co., in Brooklyn; for the new Pier 14 of the American Line of Steamers and for the City & Suburban railroad in Baltimore.

The sales of the Consolidated Car Heating Co., of Albany, N. Y., organized August, 1889, have just passed the million dollar mark, the total at the close of business, Nov. 4, being \$1,003,598. These figures show clearly the progress which the company has made and the success it has had.

The American Brake Co. has reopened its north-western office at 132 Endicott Arcade, St. Paul, Minn. Mr. F. B. Farmer, for the past three years with the Westinghouse Air-Brake Co., has been appointed Northwestern Agent.

The Twin City Rapid Transit Co., of Minneapolis, has awarded the contract for equipping 25 cars, operated on the "Interurban line" between St. Paul and Minneapolis, with the fireproof Baker heater, to W. C. Baker, of New York.

The Westinghouse air-brake is being put on the engines of the Long Island road used on the Manhattan Beach and Rockaway Beach divisions, and also on the 10 compound locomotives built in 1892. All these engines have heretofore been equipped with the vacuum brake.

The Morton Safety Heating Company, of Baltimore, is now busy equipping 100 cars of the Lake Street Elevated road of Chicago for its system of car heating. It also has orders to put this system on a number of cars of the Grand Trunk, which had cars equipped with this system in service last winter.

The H. K. Porter Company will enlarge its plant at Fiftieth street, Pittsburgh, by a new brick machine shop 72 x 135 ft. and two stories high. Its cost will be about \$18,000. The company will also build a new office building at Forty-ninth street. It will be of brick and cost about \$5,000.

The Williamsport Board of Trade is endeavoring to secure the removal of the shops of the Pardee Car Works now at Watsonstown, Pa., to that city.

The Lehigh Valley Creosoting Co. has removed its office from Jersey City to Rooms 136 and 137 Washington Building, 1 Broadway, New York City.

The Charles J. Ely Car Co. was chartered at Charleston, W. Va., Nov. 20. The incorporators are Charles J. Ely, Frederick Malter, F. J. Ball, James P. Morgan and Frederick Ely, all of Wheeling, and the principal office will be in Wheeling.

The construction department of the Philadelphia Bridge Works, at Pottstown, Pa., has resumed operations on double turn, and the nail mill of the Pottstown Iron Company has started 20 machines.

#### Iron and Steel.

The Hamilton (Ont.) Iron & Steel Co. has secured a charter in Canada with power to construct mills and railroad lines to be operated in the company's interest. The machinery, it is said, is being constructed in the United States.

The Norristown Steel Co., Norristown, Pa., has been organized with the following officers: President, H. H. Haines; Vice-President, E. M. Daniels; Treasurer, C. H. Higley; Secretary, Joseph H. Hampton; General Manager, George J. Humbert.

The following companies have been chartered in Illinois: The Southwestern Construction Co., of East St. Louis, with a capital stock of \$100,000, by Adiel Sherwood, Charles Voyce, and Joseph P. O'Connor; and the Convertible Car Mfg. Co., of Chicago, by Edward Bornemann, Frank H. McCulloch and Robert Widdowson. The Chicago Emery Wheel Co. has increased its stock from \$10,000 to \$50,000.

#### New Stations and Shops.

The Union Depot Company at Columbus, O., will erect an addition to the present Union Station in that city next spring, which it is estimated will cost from \$150,000 to \$200,000. It will have an esplanade about 100 ft. in length, and will practically be a new separate depot, though erected so as to join the old structure. The plans are being prepared.

The Civic Finance Committee of the Quebec City Council has recommended to the Council to vote the sum of \$25,000 to the Richelieu Navigation Co. to secure the erection of the company's workshops in that city.

#### Gas in Buffet Cars.

The Pullman and the Wagner Palace Car companies are extending the use of Pintsch gas to their buffet cars for heating the urns, and it is found much cleaner and more satisfactory in the confined space in which the porter has to work. A specially constructed burner furnishes sufficient heat. This new departure tends to eliminate the use of oil entirely from the cars.

#### The Busk Tunnel.

Rails are now being laid through the tunnel, and a snow shed will be built at each end. Trains will be running through the tunnel after Dec. 5.

#### The Report of State Engineer Schenck.

That portion of the State Engineer and Surveyor's report to the Legislature of the State of New York dealing with the projected ship canal through the state excites both interest and astonishment. The State Engineer, besides referring to the undoubted great cost of the contemplated canal, says of the water supply: "The question of an adequate water supply to be obtained without very serious detriment to an immense number of large manufacturing interests is a very grave one. . . . It is perhaps true that a supply of water for the eastern portion of the proposed canal might be obtained by a diversion of the waters of the whole western watershed of the Adirondacks, but in that event what compensation shall be made to the vast manufacturing interests that now receive their supply from that locality?" There are grounds for doubting if it is any part of the duty, or even the right, of a state or general government to interfere with the large capitals now invested in railroads parallel to this proposed improvement by building a free waterway of large dimensions. But it is astonishing that one who has been State Engineer for nearly three years is so ignorant of the paper, "The Radical Enlargement of the Artificial Waterway Between the Lakes and the Hudson River," read before the American Society of Civil Engineers by one of his predecessors, Elmhurst Sweet, in 1885, that he should think it necessary to rob the mills of the Adirondack region of power. Mr. Sweet's plan, as we thought every one who had investigated the problem knew, was to feed the canal from Lake Erie. This would reduce lockage to the minimum, and is far from destroying mill sites. If the canal passed from 10,000 to 12,000 cu. ft. per second, it would distribute about 500,000 H. P. along its line and probably make the Hudson potable to near Newburgh, as the low water flow of the Hudson is only about 1,200 cu. ft. per second. If the prism of the canal was designed with sufficient capacity to pass the probable traffic the flow of water mentioned would not make a current of over  $2\frac{1}{2}$  ft. per second, which would not interfere with navigation in either direction. Mr. Schenck recommends an act "requesting the Executive to appoint a commission whose duty it should be to examine into this matter and report its conclusion to the legislature at the earliest time practicable." The requisite in this matter is a survey.

#### A New Niagara Bridge.

A press dispatch says that "a new bridge will span the Niagara River where the old railroad suspension bridge now stands, within a year." This may be true or may not be. The fact is that the Grand Trunk Railway Company on the one side and the Niagara Falls Suspension Bridge companies on the other side are considering the matter, and it is true that Mr. Buck, Engineer for the bridge companies, and Mr. Hobson, Engineer for the



Grand Trunk, have recently visited the ground for conference. It is rather hard to see why either of these gentlemen should need to go on the ground in order to help them in arriving at conclusions, for both of them must know every bush and stone; still it is probably a convenient place to meet. We will venture a prediction that a bridge will be built within a few years, but not that it will be built within one or two years, nor would we venture to predict whether or not it will be built by the bridge companies or by the Grand Trunk itself.

#### Railroads in China.

We learn through Mr. C. W. Kinder that the China Railway Company is pushing on through Manchuri toward Kirin, and that 130 miles is now under construction. The country is rough and there will be more than 20,000 ft. of bridging. The material for the bridges has been received from Scotland and worked up at the China Railway Company's Works at Shan Hai Kwan. There are four bridges of over 2,000 ft. length each and one tunnel of 800 ft.

#### THE SCRAP HEAP.

##### Notes.

The Erie has reopened some of the block signal offices, which were closed a few weeks ago on account of the hard times.

The Lake Shore & Michigan Southern has re-engaged some of the copyers in train dispatchers' offices who were discharged on account of the hard times.

The Illinois Central has nearly completed its new grain elevator at New Orleans, which is 60 x 113 ft., 131 ft. high, and has a capacity of 250,000 bushels of grain.

The suits entered against the Boston & Albany for personal damages in connection with the bridge disaster at Chester, Mass., Aug. 31, amount to \$261,000 in the Boston courts alone.

At Ottawa, Ont., the government has contracted with the Electric Street Railroad Company to carry mails between the postoffice and the railroad stations. Special cars have been built for the service.

The employees of the Mobile & Ohio have voted by a large majority to accept the reduction in wages until March 4, as proposed by President Clark. The employees of the "Big Four" who struck at Cairo, Ill., have agreed to the terms of the company.

A verdict on the collision at Seventy-first street, Chicago, was returned by the coroner's jury at Chicago, Nov. 15. It holds the road responsible for criminal neglect, and the conductor and flagman are held to be tried on a criminal charge of negligence.

The Communipaw Ferryman's Beneficial Association is the name of an organization recently established by the ferry employees of the Central of New Jersey. Temporary officers are: Wm. H. Engel, President; James H. Perry, Treasurer, and Charles H. Gregory, Secretary.

The new Union Station of the Boston & Maine, on the north side of Boston, was put in use on Monday morning last, although it is not yet fully completed. According to the accounts in the Boston papers, the trains of the Fitchburg road have not yet begun to run to the new station.

Eugene Debs, who for several months has been working up the American Railway Union, which he expects to make so much better than all other railroad brotherhoods that every one will join it, has now taken up the cause of clerks, and offers to give them the benefit of his organization if they will join.

At a water station on the Pennsylvania near Canton, O., on the night of Nov. 18, detectives captured eight tramps, who, it is said, had entered passenger trains while they were standing at that station, and had stolen overcoats and other property of passengers. The tramps resisted arrest and one of them was shot.

People along the line of the Missouri Pacific, between Topeka and Fort Scott, Kan., complained to the railroad commissioners when the road took off its passenger trains a month or two ago and left no accommodation for passengers better than mixed trains, and now the commissioners have ordered the passenger train restored. It is said that the road will not obey the order unless it is confirmed by the courts.

It is stated that all of the robbers who attacked the train of the Peoria, Decatur & Evansville, near Lincoln, Ill., Nov. 13, have been caught. Edward Hogan and D. W. Hogan have been sentenced to five years' imprisonment for the express robbery on the Mineral Range railroad in northern Michigan a few weeks ago. D. W. Hogan was the express messenger in charge of the stolen money. As he was a party to the theft the crime was not highway robbery, hence the light sentences.

The Supreme Court has vacated the injunctions obtained against the New York Central, which directed the road to admit certain complaining hackmen to the station yards at Niagara Falls. This gives the Miller & Brundage Coach Co. the exclusive right to maintain hacks on the premises of the railroad and sustains the validity of the contract between it and the New York Central providing for such privileges, which the other hackmen sought to set aside as being contrary to the law governing common carriers.

Most of the roads which have taken off through passenger trains on account of the diminution in travel have taken off some local trains also. It is stated that the total daily train-mileage discontinued by the New York, New Haven & Hartford is about 800 miles. The

Boston & Albany has taken off two through trains each way. The Boston & Maine has taken off about 40 trains, reducing the daily train-mileage about 3,000 miles. The Central Vermont has made a considerable reduction, taking off the through night train between Rutland and Boston, which runs over the Fitchburg.

Press dispatches of Nov. 15 reported that John A. Drake, Treasurer of the Indiana, Illinois & Iowa road, was knocked down and robbed about seven o'clock on the morning of that day, in his office, on the ninth floor of the Rookery Building, Chicago. The amount of money lost was \$21,000 which Mr. Drake was just starting to carry out on the line of his road to pay off employees with. The robbers are said to have descended in the elevator unnoticed. The police have been unable to find any clue to the robbers, and they claim that Mr. Drake has not divulged all the facts in the case.

The Railroad Commissioners of Connecticut have been appealed to in the matter of the use of the so-called Union passenger station at Hartford by the passengers of the New York & New England, and they have decided that the doors of the waiting-room which lead to the separate station built by the New York & New England when it ceased using the Union station must be kept unfastened. It will be remembered that this station was built under a special law, the aim of which was to accommodate all roads entering the city. After a few years the New York, New Haven & Hartford, the owner of the building, drove out the New York & New England, and that road built an independent station near by. It appears that certain doors of the larger station were kept locked in order to prevent the use of the rooms by passengers of the New England road.

#### South American Notes.

The Conde d'Eu Railway, Brazil, took in a total of 229,000 mil reis, in the year ended June 30, with expenses amounting to 183,000 mil reis. The length of the line is 87 miles.

The receipts of the Southern Brazilian Rio Grande do Sul Railway for the half year ended June 30 were 30,000 mil reis larger than for the corresponding period of 1892. The loss on exchange has also been 9,000 mil reis less than last year.

The gross receipts of the Brazilian Submarine Telegraph Co. for the half year ended June 30, 1893, were \$530,000, and the expenses for the same period were \$200,000. Of the expenses \$50,000 were due to extensive repairs of plant. The receipts were \$35,000 less than for the first half of 1892.

The line between the states of Coahuila and Nuevo Leon, which has been in dispute for 200 years, has been finally settled by arbitration. This boundary, which is 600 kilometers in length, is now to be surveyed and marked with suitable monuments. The engineers appointed to superintend this work are Francisco Bettran for Nuevo Leon and T. S. Abbott for Coahuila. The work will be begun without delay.

#### Lake Notes.

The American shipbuilders are having very little to do, and work has been stopped on one of the Northern line passenger boats under construction at the Globe Iron Works, Cleveland, from the plans of Miers Coryell, until the first boat has had a trial.

A late report of the Canadian Minister of Marine and Fisheries shows that the Mercantile Marine of Canada, which for the five years ending with 1881 averaged 1,320,000 tons, fell to 964,129 tons in 1892. In this report the sea and lake shipping is not differentiated, but on the lakes the Canadian marine is very much handicapped by its inability to carry freight between United States ports, and only about six per cent. of the tonnage through the "Soo" is Canadian.

Up to Nov. 1 the traffic through the St. Mary's Falls Canal shows a net decrease, as compared with last year's returns, of 5.8 per cent., which does not seem great enough to account for the demoralization of freight rates. The shipments of coal, hard and soft, were 2,704,636 tons, an increase of .6 per cent. Iron ore decreased 19.3 per cent., but flour increased 30.4 per cent., and corn 45.6 per cent. There has been an increase in every item of freight except iron ore; in that the loss has been 592,354 tons. It is now thought that the shipments by water from all ranges will be about 5,750,000 tons, and, allowing rail shipments to amount to 250,000 tons, the total shipments may equal 6,000,000 tons. Escanaba will probably ship about 2,000,000 tons of ore as against 4,000,000 tons last year. The influence of the Mesabi range is very clearly indicated in the large decrease in Escanaba shipments as compared with those of Lake Superior.

Our exchanges from the lakes have a cut and description of the new ore dock of the Duluth, Mesabi & Northern at West Duluth from which from 50,000 to 60,000 tons of ore have been shipped weekly for some time. The dock is 2,400 ft. long, with an approach about 600 ft. long. The height is 52½ ft. above mean water level, and width 50 ft., four tracks being laid side by side. There are 500 ore pockets, with a capacity of about 150 tons each, the present capacity of the dock being about 75,000 tons. It is expected that this will reach 100,000 tons when the work is completed. The channel has been dredged out on either side of the dock, and the intention is to have a depth of 20 ft. The channel will be extended 90 ft. back of the present shore line, it is contemplated, the lay of the land being such that this can be done advantageously. With prompt work by the railroad, 2,500,000 tons could be shipped from this dock in an ordinary season.

#### Commissioners' Report on Accident at Wallingford, Vt.

The report of the Railroad Commissioners of Vermont has just been issued on the accident on the Bennington & Rutland Sept. 6, where the night express was derailed at a bridge. The train consisted of an engine, tender and six cars. All passed over the bridge in safety except the rear sleeping car, which landed on the roadbed outside of the bridge, its rear truck dropping to the river below. The examination of the wrecked bridge and car on the morning of the accident developed the fact that the bridge had been tampered with.

In the third, fourth and fifth panels all of the nuts had been removed from the upper end of the sustaining bolts of the crossbeams on the east side of the bridge, and all but two in the sixth panel. Upon the west side

of the bridge six nuts had been removed in the third, all but one in the fourth and fifth, and all but three in the sixth panel.

The conclusion is irresistible from the examination made and testimony heard that these nuts had been removed that night preparatory to a destructive wreck of this train. Most of them were found lying upon the bridge timbers where they were taken from the bolts. The night passenger train bound south had passed over this bridge between 12:05 and 12:10 o'clock the same morning, and nothing unusual was noticed by any one.

The board finds that this bridge was of good construction and material, and that it was carefully looked after by the road and the Bridgmaster and his assistants.

Effort was made at the investigation to ascertain a motive for the crime. No development was reached pointing to a probability that the deed was done out of a purpose of revenge or mere maliciousness; but that it was the work of designing or revengeful criminals or of an insane person the board is not in doubt.

#### A Preferred-Stock Problem.

There are good reasons in many cases for the issue of two classes of stocks, preferred and common. When a railroad is reorganized, and when the then bondholders must reduce the amount of interest which the company obligates itself to pay, it is far better that the reduction should be made good to the mortgagees by the issue of stock than of income or preference bonds; income bonds are a contradiction in terms, for the holder is not really a creditor, but a partner. Yet the idea has been held that preferred stocks are the same as bonds; that the company is as much bound to pay the stipulated dividend as it is its current interest obligations. A case in point is the recent dispute as to the preferred stock of the St. Louis & San Francisco; these shares were guaranteed seven per cent., as the holders supposed, though their claim in law and in fact was weak and was at last compromised. A case is on record where an Ohio company in like manner guaranteed dividends on its preferred stock, and went so far as to execute a mortgage in support of the promise. The court promptly decided that a mortgage given to secure profits was invalid.

But a more difficult question remains. Preferred shares put out 25 years ago, and carrying with them the high dividends ruling at the time of their issue, are now receiving a yearly return much in excess of the common rate of interest. The preferred stock of the Chicago, Milwaukee & St. Paul has received seven per cent. for a long period, though the dividend on the common fell from seven per cent. to nothing for four years, with a recent recovery to four per cent. When we consider that both classes are partners in the enterprise, and supposed to be sharers of the earnings, the result to the preferred holders must be very satisfactory. The agreement about certain St. Paul bonds, however, certainly puts the common stock at a great disadvantage. These bonds have the privilege of conversion into preferred shares. The La Crosse Division bonds due in 1893, and amounting to \$5,000,000, were in great part so converted, while the amount of the mortgages still outstanding, which will probably be so exchanged before maturity, exceeds \$25,000,000, all coming due within 10 or 12 years. There is, therefore, good prospect for a large increase in the issue of preferred stock for this purpose alone. These bonds as they mature could easily be replaced on a basis of about four per cent., with a saving in interest charges of nearly a million a year. The common stock of this company has the prospect of losing annually about two per cent. on the present number of shares when this exchange is fully carried out. The agreement practically extends the old rate of bond interest, seven per cent., in perpetuity—for the full dividend must be paid on the preferred before the common receives anything. In 20 years things have changed greatly. The theory of preferred stock is that it shall be entitled to be paid the ruling rate of dividends or interest before the common shares receive anything. The common stock takes more chances, and is entitled to the profits over and above a normal return to the preferred. . . . A payment of four or five per cent. now to the preferred would but carry out the original intention. But while the bonds expire, the preferred shares have no maturity, and, so far as the common stock is concerned, the bonds at seven per cent. might as well run on indefinitely.

This brings up one of the most difficult questions in modern finance—the equity of a continuing contract for payment of a fixed sum, regardless of changed circumstances. There seems no machinery for adjusting the problem.—*Evening Post* (New York).

#### The Nicaragua Canal.

The Maritime Canal Company of Nicaragua, which owns the concessions for the Nicaragua Canal, filed its annual report this week with the Secretary of the Interior. The report states that the paid in capital stock amounts to \$1,006,940 and that since the organization of the company \$330,788 have been expended in cash for construction and administration expenses besides share capital of the par value of \$3,199,000. First mortgage bonds for \$6,855,000 have also been issued. The company has issued 180,000 shares of its capital stock in payment of concessionary rights, franchises, etc. The financial embarrassment of the Nicaragua Canal Construction Co. is referred to and it is stated that the reorganization of that company upon a sound financial basis is now well under way and it is expected that the construction company will be able to resume the active prosecution of work on the canal.

#### The Pullman and Wagner Exhibition Cars.

The Pullman exhibition cars were taken from the Transportation Building last week. They will be sent to Pullman, Ill., where they will be stored in a special building for exhibition purposes. It is intended to put them in service only on special occasions.

The Wagner cars, with engine 999, together with the train exhibited by the London & North Western Railway, left Jackson Park last Monday; the two trains will be exhibited in the cities between Chicago and New York along the lines of the Lake Shore & Michigan Southern and New York Central. The Wagner train will not be put in regular service at present.

#### An Imperial Train.

The imperial Austrian train is described at some length in a recent issue of the *Organ für die Fortschritte des Eisenbahnwesens*, and elevations and sectional plans of the different cars are given. The train is made up of eight cars in all, beginning with a baggage car which also contains a special compartment for the conductor and the electric plant for lighting the train. This is followed by a servants' car, after which come, in succession, the car of the emperor, a car for the emperor's suite, a dining car, a special kitchen car, another car for additional members of the suite, and finally a



combination servants' and baggage car. The current for lighting the cars is furnished both by a dynamo and by a storage battery, the arrangement being such that the latter comes into action if through any cause the operation of the dynamo should become interrupted. The storage battery is capable of supplying the 67 lamps with which the train is equipped for a period of 10 hours. The train is heated by steam furnished from a special heating boiler, and the cars all are supplied with the ordinary hand, as well as Vacuum and Westinghouse brakes.

#### Congress of European Railroad Employees.

The international congress of railroad employees held at Zurich, Switzerland, a short time ago, was attended by a large number of delegates from England, France, Austria, Italy, Holland, and Switzerland. International organization was the principal subject discussed and will be again taken up at the meeting next year which is to be held at Paris and at which a French committee, appointed to formulate a plan of organization, is to report. An appeal was also addressed to the general traveling public to second the efforts of the Congress to secure an eight-hour day for all railroad employees in the transportation departments, with an uninterrupted period of rest of 36 hours each week, 17 of these holidays to fall on Sundays, on which traffic is to be curtailed.

#### Toronto's New Union Station.

Toronto is at last to have its new Union station, the Canadian Pacific & Grand Trunk road having recently agreed upon definite action. In the construction of the new station the old Union Station is not to disappear. A new trainshed will be erected south of the present structure for trains arriving from the East or leaving for the West, while the present trainshed will serve for eastbound trains made up at Toronto. Contracts have already been given for the construction of the new trainshed. The roof trusses will have a span of 80 ft. and will be 40 ft. high. A new platform will be built along the new south trainshed from West Simcoe street to east of York street, and the present platform will be extended to equal the length of the new one. A third platform will be built between the present tracks, and an overhead bridge will be built between the platforms. The interior of the old station will be remodeled, and the present dining room will be extended. The greatest changes, however, will be made north of the present structure. Here a new seven story structure of red Credit Valley stone and pressed brick will be built.

It will have a frontage of 100 ft. on Front street, with a depth of 136 ft. The main entrance will be in the form of an archway 28 ft. high and 43 ft. wide. At the eastern angle of the building on Front street will be a tower or campanile 180 ft. in height. The rotunda will be 80 ft. square, with marble floor and wainscoting of oak, the walls being finished in buff pressed brick. On the eastern side are to be ticket offices, the receiving baggage room being opposite. Beyond the entrance hallway is to be an arcade, with stores on the ground floor. This will be surrounded by a gallery on the second floor, where some of the railroad offices will be located. The five stories above the gallery will also be used to accommodate the officials of the two roads now scattered in various buildings throughout the city. Beyond this arcade the building is connected with the addition projected from the northern side of the old Union Station. This is a spacious two story structure, to contain a general waiting room 81 ft. square, with a restaurant and two smaller waiting rooms located on either side.

#### The Kodak as "Spotter."

The reporters have recently discovered that some of the railroads running into Chicago are making use of the kodak as a "spotter." Railroads generally have rules which state that employees shall not visit saloons while on duty, and shall not make them loafing places while off duty. Heretofore it has been quite easy for a man, when accused by his superior of either of the foregoing failings, to claim that the informer was telling a falsehood for spite, or that it was a case of mistaken identity. Now, however, when a man is "called up" to see a "super" and attempts to deny his frequent visits to saloons, and remarks that the warning to keep away from such places is uncalled for, he is shown a number of pictures of himself taken, perhaps, in the very act of bending his elbow; he thinks it time to give up. Apparently there is a great field opening for the camera, but care must be taken to use more truthful ones than the one used by the official photographer at the Fair in taking photographs for passes; otherwise, when a man is shown what is claimed to be his photograph there will be no proof but the statement of the operator.

There are other uses to which the camera may be put, a few of which may be mentioned here: It might be used to show how section men work just before a train passes or just after it has passed, and when no trains are in sight; also to photograph the general offices when the "boss" is in and when he is out. But it is not necessary to enlarge upon this.

#### LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works has again been put on full time. The shops have been running eight hours a day for four days a week, but now they will be run six days a week 10 hours a day. The following statement is made by one of the officers of the company: "At the beginning of the panicky season which we have experienced the orders that had been coming in with regularity began to fall off until finally they ceased. Besides this the roads that had given us orders stopped work on their engines until better conditions prevailed. Although we have received no new orders of any importance we were notified a few days ago to continue work on a large order of engines, and it is for this reason that the increase in time is to be put in force. During the late depression the regular orders stopped, and the time is not far off, I believe, when the different companies will start to catch up again. Business is already showing signs of a revival. There are more frequent inquiries and a growing disposition to do business."

#### CAR BUILDING.

The West Ridge Coal Co., of Scranton, Pa., is in the market for a small number of cars.

The Long Island order mentioned last week is for 75 passenger cars. The bids will be opened on Dec. 1.

The Illinois Central last week gave a contract to the Pullman Car Co. for building 150 freight cars of several types.

The Columbus, Hocking Valley & Toledo has issued

specifications for 1,000 cars, about 700 of the number to be hopper bottom coal cars.

The Michigan-Peninsular Car Co., of Detroit, has recently contracted with the Lake Shore & Michigan Southern for building 300 cars, and it is understood that the order may be increased to 500 cars shortly.

The recent reports that the Cleveland, Cincinnati, Chicago & St. Louis would soon give out orders for new passenger equipment we have high authority for stating are untrue. There is no intention of ordering new passenger cars at the present time.

#### BRIDGE BUILDING.

**Hamilton, Ont.**—The Dominion Government is to be petitioned to assist in the construction of a bridge to be erected across Burlington Canal.

**Hays, Pa.**—A charter was granted at Harrisburg last week to the Glenwood Highway Bridge Co. with a capitalization of \$5,000. This company will erect a bridge across the river from the crossing of the Pittsburgh & Connellsville Railroad and Second avenue to Hays station in Baldwin Township. The directors are James P. Wilson, Herman E. Laub and Everett G. Weinschenk. The bridge will cost \$150,000.

**Newcastle, N. B.**—A bridge about 1,275 ft. in length is being erected across the mouth of the Newcastle River at Newcastle, Queens County. Work has been in progress for about 20 days.

**St. Boniface, Man.**—The town authorities are inviting plans for a bridge to be constructed across the Assiniboine River at this place.

**St. Cloud, Minn.**—The contract for the piers and abutments for the new St. Germain street bridge, has been awarded to Foley Brothers & Guthrie, of St. Paul, for \$14,000.

**West Chester, Pa.**—Land has been purchased for the erection of an iron bridge over the tracks of the Pennsylvania at the first crossing west of Pomeroy.

**Winnipeg, Man.**—The Board of Works has instructed the City Engineer to report upon the cost of constructing a heavy steel traffic bridge across the Assiniboine River at Main street. It is estimated that the bridge will cost \$90,000, and that the Electric Street Railway Co. will contribute to the cost of the construction of the bridge.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

*Delaware & Bound Brook*, quarterly, 2 per cent.

*Catawissa*, semi-annual, 3½ per cent. on the preferred stock, payable on demand.

*Chicago & Northwestern*, quarterly, 1½ per cent. on the preferred stock and 3 per cent. on the common stock, payable Dec. 26.

*Chicago, St. Paul, Minneapolis & Omaha*, semi-annual, 3½ per cent. on the preferred stock, payable Jan. 20.

##### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Atlantic & Pacific*, annual, New York City, Dec. 14.

*Boston & Maine*, special, Lawrence, Mass., Nov. 29.

*Columbus, Shawnee & Hocking*, special, Columbus, O., Dec. 20. To consider the proposed consolidation with the Sandusky & Columbus Short Line.

*Grand River Valley*, special, Jackson, Mich., Jan. 10.

*Lehigh & Hudson*, annual, New York City, Dec. 4.

*New York, Lake Erie & Western*, annual, New York City, Nov. 28.

*New York, Pennsylvania & Ohio*, annual, Cleveland, O., Dec. 6.

*Sandusky & Columbus Short Line*, special, Sandusky, O., Dec. 21. To consider the proposed consolidation with the Columbus, Shawnee & Hocking.

*Ulster & Delaware*, annual, Rondout, N. Y., Dec. 5.

##### Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7:30 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Shaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms

of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

#### Southern & Southwestern Railway Club.

A meeting of the Southern & Southwestern Railway Club was held at the Kimball House, Atlanta, Ga., on Nov. 15. The following officers were elected: Mr. Pulaski Leeds, of the Louisville & Nashville, President; E. M. Roberts, of the South Carolina road, First Vice-President; F. H. McGee, of the Central of Georgia, Second Vice-President; A. G. Steinbrenner, of St. Louis, Treasurer; and S. A. Charpiot, of Macon, Secretary.

#### Boston Society of Civil Engineers.

A regular meeting of the Society was held at its rooms, 36 Bromfield street, Boston, on Wednesday evening, Nov. 15, 1893.

Messrs. Percy L. Barker, of Hanover, N. H., and Adelbert K. Sprague, of Boston, were elected members of the Society.

Mr. George A. Kimball, for the committee appointed to prepare a memoir of the late Augustus W. Locke, submitted its report.

In the absence of the author, the Secretary read a paper by Arthur W. Hunking, entitled "Notes on Water Power Equipment and Considerations Affecting the Selection of a Turbine."

Prof. Dwight Porter read a short paper, outlining the course of instructions at the Massachusetts Institute of Technology on the construction of turbines. In the discussion which followed, President Freeman and Messrs. F. S. Hart and Franklin L. Pope took part.

Afterward the members examined the exhibit of surveying instruments which Messrs. Buff and Berger had placed on the platform. The exhibit comprised the whole of the very extensive display made by this firm at the World's Fair in Chicago, and contained many interesting novelties. Mr. Berger explained some of these special features.

#### Engineers Club of Philadelphia.

A business meeting of the Club was held on Saturday, Nov. 18, at 20 o'clock. There was a general discussion of a paper on "The Riveting Pressures Required for Bridge and Boiler Work." A paper was presented by Mr. Pierre Giron, on "The Grinding of Portland Cement." In this paper the author starts with the burning of the cement; he then relates that the strength of mortar increases in proportion to its fineness and that there is great economy of reducing all the grains to a fine powder. He illustrates the progress made in grinding cement by the following comparisons—a few years ago the best brands of cement would leave a residue on, a No. 50 sieve, of 3 to 10 per cent.

a No. 80 sieve, of 15 to 20 per cent.

a No. 200 sieve, of 40 to 50 per cent.

while the best cements of to-day leave on

a No. 50 sieve, 0 per cent.

a No. 80 sieve, 5 to 6 per cent.

a No. 200 sieve, 25 to 30 per cent.

The extra cost of grinding is found to be more than compensated by the use of finely ground cement, as it may be used with a larger proportion of sand. The machinery used to-day is that of 25 years ago with improvements and natural developments. The clinkers are first crushed, then passed through rolls, and the final grinding is usually done with millstones. The author concludes his paper by a description of a new machine called the Morel Ball Pulverizer, which is said to be the largest machine of its kind ever built.

The next social meeting will be held in the evening of Nov. 25.

#### Association of Engineers of Virginia.

An informal monthly meeting of the Association was held at Roanoke, Nov. 15, 1893, at 8:00 p. m. The subject for the evening was "The Slide Rule and Similar Aids to Calculation." The discussion was opened by Mr. M. E. Yeatman, who explained the principle of the plain slide rule and the method of use. He followed with an explanation of the advantages to be gained by a circular slide rule, and Thacher's cylindrical slide rule, having an effective length of scale of 30 ft., was explained fully, with examples showing the manner of using it. Mr. Yeatman closed by giving a comparison of the accuracy of the three types of slide rules as follows:

The plain slide rule 10 in. long gives results accurate to within one part in 216 parts.

The circular slide rule 8 in. diameter gives results accurate to within one part in 1,080 parts.

The Thacher cylindrical slide rule gives results accurate to within one part in 15,400 parts, assuming in each case that graduations can be read to within 1/16 in.

Mr. G. R. Henderson presented a specimen of logarithmic cross section paper and explained its application to the graphical solution of any formula having the form  $y = bax^n$ . Every such equation can be reduced to a logarithmic equation of the first degree, as,  $\log y = \log b + n \log x$ ; and, therefore, when plotted on logarithmic paper it appears as a straight line. The solution of such an equation is readily obtained by simple inspection. He illustrated the application of this paper by showing a straight line giving by inspection the ordinate of the parabola  $y^2 = 4x$ , and the hyperbola  $xy = 10$ . He showed the practical application in the determination of the safe load on spiral springs and their deflection under given loads.  $P = \frac{80,000 \pi d^3}{16 R}$  where  $\pi = 3.1416$ ,  $d =$  diameter of wire and  $R$  radius of coil in inches. Deflection with one ton load for spring 100 in. long equals  $0.17 \frac{R^2}{d^4}$ . This paper is designed by W. F. Durand, of Cornell University, and is manufactured by Andrews & Church, of Ithaca, N. Y., costing 60 cents per quire, sheets being 11 in. square. The discussion was joined in by R. de Saussure, R. H. Soule, C. C.



Wentworth and H. Gillis. Mr. de Saussure explained the application of the logarithmic spiral curve to the same uses as the slide rule.

The subjects for the coming monthly meetings were announced as follows: "The Sewage System of the City of Roanoke," discussion opened by Mr. Dunlap; "Railroad Signaling," discussion opened by C. S. Churchill; "Aluminum Alloys," discussion opened by S. Wallis; "Modern Boiler Practice," discussion opened by Geo. R. Henderson. Next monthly meeting Wednesday, Dec. 20, 1893, 8 p. m. Subject: "Sewage System of the City of Roanoke."

#### PERSONAL.

—Mr. O. V. Smith, Traffic Manager of Seaboard Air Line, accompanied by his wife, sailed for Europe on Nov. 15, en route to Carlsbad, his physicians having recommended him to try the waters there.

—Mr. Carlton W. McKinney has resigned as Superintendent of the Steel Manufacturing Department of the Maryland Steel Co. at Sparrow's Point, Md., and will return to the Lackawanna Iron & Steel Co. as Manager at Scranton, to succeed Mr. C. E. Mattes.

—Assistant Director of Works Graham, of the World's Columbian Exposition, has had his title changed to General Manager. Mr. Graham's duties will not be changed, the alteration of his title being made because of the resignation of Director of Works Burnham.

—Mr. W. W. Peabody, Jr., who was Secretary of the old Baltimore & Ohio Southwestern road, has been appointed under the reorganization to the post of Assistant to Mr. W. W. Peabody, who continues to act as Vice-President and General Manager of the consolidated company.

—Mr. Eaton N. Frisbie, a native of Bradford County, Pa., and at various times President of the State Line & Sullivan, General Agent of the Erie, with headquarters at Elmira, N. Y., and one of the builders of the Schuylkill & Lehigh Valley, road died at his home in Passaic, N. J., Nov. 13.

—Mr. Roswell Miller, President of the Chicago, Milwaukee & St. Paul road, and Miss Mary L. Roberts, of New York, were married in that city on Nov. 16, the ceremony being performed by the bride's father, Rev. W. C. Roberts, a General Secretary of the Presbyterian Board of Missions.

—Mr. William Hodgdon has been appointed Assistant General Freight Agent of the Baltimore & Ohio Southwestern, having his headquarters at Cincinnati, O. This is a new office, and it was created on account of the removal of the office of General Freight Agent from Cincinnati to St. Louis.

—Mr. James H. Perry has been appointed Chief Engineer of Floating Equipment of the Central of New Jersey. He will have charge of the machinery of all vessels belonging to that company. The repairs and maintenance of hulls will be in charge of Mr. F. F. Gregory, Superintendent of Ferries.

—Mr. Stephen Little, of New York, the well-known railroad accountant, who has just completed an examination of the accounts of the Philadelphia & Reading Railroad for a committee of the bondholders, has been engaged with Mr. John Scott to make an examination of the financial condition of the Northern Pacific for a bondholders' committee of that company.

—Mr. Sumner J. Collins, for the past three years General Superintendent of the Louisville, New Albany & Chicago Railroad, has resigned to become General Superintendent of the Wisconsin Central system. Mr. Collins was for some years Division Superintendent of the Chicago, Milwaukee & St. Paul. He is a brother of Mr. W. W. Collins, now General Superintendent of that road.

—Mr. J. H. Sessions has resigned the office of Assistant General Freight Agent of the Peoria & Eastern, having been appointed Chicago representative of the Philadelphia & Reading Coal and Iron Company, in charge of its Western business. Mr. Sessions was formerly General Freight and Passenger Agent of the Terre Haute & Peoria road, and in 1892 became Assistant General Freight Agent of the Vandalia line.

—Maj. John W. Green has resigned his position as General Manager of the Georgia road. He will probably be succeeded by Mr. T. K. Scott, at present Acting General Manager of the road. Major Green was granted six months' leave of absence last summer on account of ill health, and is now residing in Richmond, Va. He has decided to resign altogether, and recently forwarded his resignation to the directors of the road.

—Mr. John T. Gerry, Superintendent and General Freight and Passenger Agent of the Burlington & Northwestern and Burlington & Western roads in Iowa, died at Burlington, Ia., on Nov. 13. Mr. Gerry had occupied these positions since 1887. He was a civil engineer and as such had considerable experience in locating new roads in the western part of the United States, particularly branch lines of the Chicago, Burlington & Quincy.

—Several new appointments have been announced on the Baltimore & Ohio Southwestern. Mr. L. C. Fritch, who was Engineer of Maintenance of Way on the Ohio & Mississippi, has been appointed Division Engineer; Mr. H. M. Hall, will be Superintendent of Bridges and Buildings, which was the office he held on the Ohio & Mississippi; Mr. H. D. Hanover retains his old title of General Roadmaster, and Mr. W. M. McMahon becomes Division Superintendent.

—Hon. Warner Miller has resigned the Presidency of the Nicaragua Canal Construction Co., and Capt. George W. Davis, Vice-President of the same company, has also resigned his connection with the company and returned to his position in the United States Army. Mr. Smith M. Reed, of Plattsburg, N. Y., a large stockholder and a well known capitalist, has been elected Vice-President, but no successor to Mr. Miller as President has yet been elected.

—Mr. J. B. Cavanaugh, formerly General Freight Agent of the Wisconsin Central, has been appointed General Freight Agent of the Evansville & Terre Haute line, with headquarters at Evansville, Ind., succeeding Mr. H. E. Felton, who resigned to accept a similar office on the Chicago & Eastern Illinois road. Mr. Cavanaugh became General Freight Agent of the Wisconsin Central in 1890, having been Assistant General Freight Agent of the road for the three years previous.

—Mr. Henry M. Frank, Trainmaster of the Western Division of the New York, Lake Erie & Western, died on Nov. 10 after a very short illness. Mr. Frank began

his career on the Western Division of the Erie road as an operator in 1876, and by faithfulness and competency rose to the position of Chief Dispatcher, being promoted to be Trainmaster in 1892, which position he held until his death. He was esteemed by all his associates and acquaintances, by whom his sudden and untimely death will be deeply regretted.

—Mr. John M. Washburn, recently Treasurer of the Old Colony Railroad, died at his home in Boston on Nov. 17, aged 73 years. Mr. Washburn was Treasurer of the Old Colony Railroad Company for 43 years, also Treasurer of the Old Colony Steamboat Company (or Fall River line) for 15 years. He was Treasurer of the Union Freight Railroad for 12 years. When Mr. Washburn retired from his official positions in September last, a shortage in his accounts, reported to be about \$100,000, was discovered, and the railroad company had recently instituted proceedings against him and his bondsmen.

—Mr. George M. Rose, engineer, chemist and metallurgist, died in Chicago on Nov. 12. Mr. Rose was 47 years of age and was a Fellow of the Royal Geological Society, and a member of several other English scientific associations. As chief-of-staff under Dr. Siemens, the distinguished metallurgist and inventor of the Siemens furnace, he established the first of these plants in many European countries. He came to America to install the plant for the Joliet Steel Company, and, having completed this work, removed to St. Paul. For the past six years he had been engaged in developing mining properties and in original chemical research.

—Mr. L. F. Day, Traffic Manager of the Chesapeake, Ohio & Southwestern road, has accepted the Chairmanship of the Southwestern Traffic Association. The term is three years and the salary, it is said, is \$10,000 a year. Mr. Day has been Traffic Manager of the Mississippi Valley route since 1892, coming to the office when the Louisville, New Orleans & Texas was operated as part of the road. He was previously Freight Traffic Manager of the St. Louis, Arkansas & Texas and had also been General Freight Agent of that road for some years. He began his railroad service in 1885 as a freight clerk with the Texas & Pacific, but in the same year went to the St. Louis, Arkansas & Texas, afterward the St. Louis Southwestern.

—Mr. George Walter Bull, General Freight and Passenger Agent of the St. Paul & Duluth, died at his residence at St. Paul, Minn., on Nov. 18. Mr. Bull had been quite ill for some time past, and for the last two months had been confined to his house. The immediate cause of death was heart failure. Mr. Bull was appointed to the position which he held at the time of his death on Feb. 1, 1890. He made friends wherever he went by his quiet and unassuming manner and honorable and straightforward dealings with all men. He was born at Gettysburg, O., on Jan. 20, 1847. He began his railroad career as a bill clerk for the "White Line" at Indianapolis. From July 1, 1866, he occupied various positions with the Union Line until July 1, 1885, when he accepted the position of Western Agent of the Merchants' Dispatch at Chicago. He held this position until, in March, 1887, he accepted a similar one with the Erie Dispatch. On Feb. 1, 1890, he resigned the latter position to accept the one he so ably filled up to the time of his death. A wife and one son survive Mr. Bull.

#### ELECTIONS AND APPOINTMENTS.

**Alabama & Great Southern.**—Edward Lauterbach has been elected President of the railroad, and S. M. Felton, Jr., has been made Vice-President, with full authority to operate the road. Besides Mr. Lauterbach, the newly-elected directors are John Greenough, Gustav Kissel, Samuel Thomas, C. S. Brice, C. C. Harvey, Francis Pavy, H. Doughty Broune, George Webb Medley, Charles Schiff and Augustus Brown Abraham. The five last-named gentlemen represent the English interests in the property.

**Alpena & Northern.**—This road was recently incorporated in Michigan by the following persons: R. A. Alger, M. S. Smith, J. C. McCaul and G. H. Stalker, of Detroit, Mich.; John Mullen, of Black River, Mich., and R. K. Hawley, of New York City.

**Baltimore & Ohio.**—At the annual meeting held in Baltimore, Nov. 20, the following directors were re-elected: William F. Burns, George Avon Lingein, James Sloan, Jr., William H. Blackford, Aubrey Pearre, George de B. Keim, Wesley A. Tucker, Maurice Gregg, Wilcox Brown, William F. Frick, George C. Jenkins and Charles J. M. Gwynn.

**Baltimore & Ohio Southwestern.**—Edward Bruce continues as Secretary of the consolidated company, with office at 2 Wall street, New York City. Frank E. Tracy has been elected Assistant Secretary, with office at Cincinnati, O. Mr. Tracy was formerly Assistant to the President of the Ohio & Mississippi.

**Bellfonte Central.**—The officers of this road, which is now ready for operation are: President, Walter N. Ross; Vice-President, S. H. Hicks; Secretary and Treasurer, William J. McHugh, with offices at 304 Walnut street, Philadelphia; General Superintendent, J. W. Gephart and General Freight Agent, Frank Warfield, with offices in Bush Arcade, Bellefonte, Pa.

**Bellingham Bay & British Columbia.**—C. L. Anderson, of San Francisco, has been appointed Superintendent of this road with headquarters at New Whatcom, Wash. He succeeds M. L. Starnstrom, who is General Agent of the Bellingham Bay Improvement Co., which owns the road, and who has been Superintendent since it was opened.

**Brownstown & Coal River.**—The principal stockholders of this newly chartered West Virginia line are George Davis, R. W. Ewers, J. N. Carnes, J. R. Guard and J. J. Lovell, all of Charleston, W. Va.

**Buffalo, Rochester & Pittsburgh.**—At the annual meeting held in New York City, Nov. 20, the following directors were elected: Frederick A. Brown, Walston H. Brown, J. H. Hoeart, Adrian Iselin, Jr., C. O'D. Iselin, George H. Lewis, Wheeler H. Peckham, Aug. Richard, James A. Roosevelt, W. Emlen Roosevelt, J. Kennedy Tod, Warren A. Wilbur and Arthur G. Yates.

**Busk Tunnel.**—At the annual meeting held in Denver, Col., Nov. 3, the following directors were elected: J. R. Busk, Joseph H. Bond, T. M. Davis, C. E. Sands and A. W. Sherman.

**Central of New Jersey.**—The Central Railroad Co. of New Jersey has reached the conclusion that it is more economical to distribute supplies from local storehouses than to concentrate the work at one general store; consequently the general storehouse at Somerville, N. J., which was established when the Port Reading road

had charge, has been abolished. C. E. Hungerford, who was in charge at Somerville, has been appointed Supervisor of Stores, with headquarters at Jersey City.

**Cleveland, Cincinnati, Chicago & St. Louis.**—The office of William Gibson, who is now Superintendent of both the Cincinnati and Sandusky divisions, has been transferred from Cincinnati to Springfield, O. Thomas Reynolds, who was formerly Superintendent of the Indianapolis Division, which has been added to the Cleveland Division, has been appointed Assistant Superintendent, and his office transferred from Indianapolis to Cincinnati.

**Duluth, Red Wing & Southern.**—At the annual meeting held in Red Wing, Minn., Nov. 8, the following directors were elected: T. B. Sheldon, L. F. Hubbard, S. B. Foot, G. H. Crary, H. E. Perkins, Red Wing, Minn.; M. J. Toher, Owatonna, Minn.; W. H. Twilford, Geneva Lake; W. C. Rice, St. Paul; A. T. Stebbins, Rochester, Minn.; W. A. Morin, Albert Lea, Minn. The officers elected were: President, T. B. Sheldon; Vice-President, S. B. Foot; Secretary and Treasurer, G. H. Crary, Red Wing, Minn.; General Manager, L. F. Hubbard; Auditor, G. C. Davis; Superintendent, L. H. Stiles.

**Great Northern.**—H. S. Wakeman has been appointed Assistant Superintendent of the Breckenridge Division, with headquarters at Willmar, Minn., vice W. V. S. Thorne, resigned.

**Illinois Central.**—A. J. Grief has been appointed Superintendent of Terminals at New Orleans, a newly created office.

**Midland Terminal.**—The annual election of officers was held in Colorado Springs last week. H. Colbran was elected President and General Manager; W. K. Gillette, Vice-President; L. R. Ford, Secretary.

**Minneapolis, St. Paul & Sault Ste. Marie.**—Carl Judson has been appointed Traveling Passenger Agent.

**Monterey & Mexican Gulf.**—Charles M. Barnett has been appointed Assistant General Freight Agent of this railroad, with headquarters at Monterey, Mex.

**Northern Pacific.**—Nelson C. Thrall, Right of Way and Lease Agent, has resigned to accept service with another company, and the position heretofore held by him will be abolished on Dec. 1.

**Richmond, Fredericksburg & Potomac.**—At the annual meeting held in Richmond, Nov. 15, President E. T. D. Myers was re-elected and W. T. Walters, B. F. Newcomer, Moncure Robinson and W. J. Leake chosen directors by the stockholders. Dr. L. B. Anderson is the director for the state.

**Rome (Ga.).**—The following changes have been announced: W. F. Ayer, Superintendent, and General Freight and Passenger Agent, is appointed Superintendent and Traffic Manager. C. K. Ayer, Auditor, is appointed General Passenger Agent and Auditor. J. H. Caldwell, local agent at Rome, Ga., is appointed General Freight Agent and local agent at Rome, Ga.

**St. Louis Merchant's Bridge Terminal.**—The annual meeting was held in St. Louis, Mo., Nov. 11, and the following directors were elected: Adolphus Busch, John T. Davis, D. R. Francis, Paul A. Fuesz, C. C. Maffitt, Charles D. McLure, John H. Overall, John D. Perry, L. M. Rumsey, John E. Liggett, C. C. Rainwater.

**St. Paul & Duluth.**—W. W. Broughton, Assistant General Freight Agent, has been appointed General Freight Agent; and W. A. Russell, Assistant General Passenger Agent, has been appointed General Passenger Agent, succeeding George W. Bull, General Freight and Passenger Agent, deceased.

**Toledo & Ohio Central.**—General Superintendent I. F. Whittelsey has reorganized the divisions and the road is now operated in five divisions: Columbus Division, Toledo to Columbus, 132 miles; H. C. Ferris, Superintendent. Corning Division, Columbus to Corning, 65 miles; J. F. Angell, Superintendent. Bucyrus Division, Toledo to Thurston, 147 miles; J. F. Angell, Division Superintendent. Ohio Division, Corning to Waggener, 70 miles; J. W. Dawson, Division Superintendent. Kanawha Division, Waggener to Cauley Bridge, W. Va., 163 miles; J. W. Dawson, Division Superintendent.

**Wisconsin Central.**—Sumner J. Collins has been appointed General Superintendent, with headquarters at Milwaukee.

#### RAILROAD CONSTRUCTION.

**Baltimore & Cumberland.**—All negotiations for right of way and all work were discontinued on this line some months ago on account of the stringency of the times, but it is now stated that all lines of the work are to be pushed with vigor. Three routes have been surveyed, the cost of construction being about the same in each case. Which of these will be selected finally will depend very largely upon the cost of the right of way. A revision of the surveys beyond Hancock has been made within a few weeks, which will necessitate the changing of a part of the work already done. Messrs. Howard, Sutherland and R. F. Stottlemeyer, who had charge of the right of way work last summer, have started out again to look over the surveyed lines to secure options on the lands needed for the road. The engineering corps party, under Mr. Murdoch, which has been at work on the surveys in the neighborhood of Hancock, were in Cumberland two weeks at work on the surveys of that end of the line. They revised the three lines already run and have again left for Hancock, where they will go over the surveys of that end of the line and make some changes.

**Bellefonte Central.**—Track-laying has been about completed from Bellefonte to Mill Hall, Pa., and early in December passenger trains will be running regularly. It is intended to put on four passenger trains each way a day. Neat station buildings have been erected at Zion, Hubersburg, Nittany Hall, Lamar, Clintondale, Mackeyville, Salona and Mill Hall, while a fine building will be erected next year at Bellefonte, Pa., which is to be the headquarters for the road.

**Brownstown & Coal River.**—This company was chartered at Charleston, W. Va., Nov. 20, to build a line from Brownstown to a point near Madison, in Boone County. The principal offices will be in Charleston, and the capital stock is \$50,000.

**Central of New Jersey.**—About 10 miles of second track has been built by the company during the past year. The new double track is in three sections on the Pennsylvania Division as follows: Rockport to Leslie Run, 3.5 miles; Drifton to Tannery, 2.3 miles, and from Mountain Park to Ashley, near Wilkes-Barre, 4 miles, a total of 9.8 miles.



**Chesapeake & Ohio.**—The work on the Twenty-mile Creek branch of this line in West Virginia is progressing finely since work was resumed a few weeks ago. The bridge for the connection between the branch and the main line across Gauley River is completed and supplies for the work up the creek can now be sent by rail to their destination. The grading up the creek is nearly all done, and the track-laying will now soon commence. In view of the early completion of the road, a number of leases of coal land have been made by prospective operators and the railroad company has double incentive to finish the road at the earliest possible day.

**Coburg, Northumberland & Pacific.**—The local projectors announce that an agreement has been made with an English syndicate for the construction of this road. The line was surveyed in 1892 by H. K. Wickstead from Coburg, Ont., about fifty miles northwest to a connection with the Canadian Pacific near Central Ontario Junction, and the locating survey when made will probably not vary very much from this line. Alexander Poe, of Coburg, is Secretary of the local company.

**Delaware & Hudson.**—The short branch from Au Sable Station, N. Y., the terminus of the branch from Plattsburgh, which has been previously mentioned, is under contract, and the work of construction is now going on. The branch will be 3½ miles long and is to be built to Au Sable Forks. The contractors are the J. & J. Rogers Co., of Au Sable Forks, N. Y.

**Duluth, Missabe & Northern.**—It is announced that the entire main line from Duluth to the Missabe iron range, about 50 miles, is to be double tracked. Work is to be begun at once and the second track is to be completed when navigation opens on the Great Lakes in 1894.

**Elkton & Southern.**—In a few weeks a meeting for the purpose of incorporating this line will be called. The road, if built, will start at Elkton or Singler, Md., on the Philadelphia Division of the Baltimore & Ohio road, continuing down the Peninsula, and probably joining the Baltimore & Eastern Shore road at Easton, Md.

**Mexican Roads.**—Surveys have been commenced for a railroad from Gomez Farias, on the Mexican National, to Concepcion del Oro, Mex., a mining camp in the State of Zacatecas. The concession for this line, without subsidy, is granted to General Olivares, of Monterey, and William Purcell, of Saltillo, and calls for a road from some point on the Mexican National to a point on the Mexican International. The line will pass through the Llama, the vine and cotton district of the State of Coahuila. The total length of the proposed road is about 200 kilometers, the length of that part now contemplated is 70 kilometers. Concepcion del Oro is an important mining camp; the ore is copper, containing some gold.

**Mexico, Cuernavaca & Pacific.**—The concession granted to the road in Mexico has been reissued, with important modifications favoring the company. This line is to extend from the City of Mexico to the Pacific Coast, and a portion of it is already built. J. H. Hampson, of the City of Mexico, the well known railroad contractor, is now President of the company.

**Midland Terminal.**—The track-laying is now going on south of Divide Station on the Colorado Midland road, the rails for the first section having been delivered at Divide last week. The line is graded south of Divide for about eight miles and it is proposed to complete the track for that distance before the cold weather requires a suspension of the work. The distance to the Cripple Creek mines is about 22 miles by this route; and unless the winter proves too severe to carry on the construction work, it is likely that trains will be running to the mines by April. The grading has been recently commenced at Cripple Creek, and the contractors will work north toward Divide. This work is being done by Clough & Davidson.

**Missouri, Kansas & Texas.**—Two lines are now being run by the surveyors of this company for an extension to San Antonio, Tex. One line starts from San Marcos, Tex., the terminus of a 50-mile branch and the second line is from Lockart, about 10 miles from that station. The length of the new line will probably not vary much from 50 miles, which is the distance by the International & Great Northern line which runs through San Marcos to San Antonio.

**Natchitoches.**—Proceedings have been instituted at Natchitoches, La., by Albert Baldwin, of New Orleans, to foreclose mortgage bonds for \$67,000 and interest held by him.

**New Roads.**—E. H. Smith, after two months' surveying for a railroad route from Maxwell City, N. M., westward toward Taos, reports that the survey has been completed for the entire distance of 73 miles. The maximum curvature is eight deg., and the greatest grade two per cent. The survey runs through Cimmaron Canon and over Taos Pass. At the head of the canon a short branch can be built at slight expense to Elizabethtown where are some good gold placers. The route goes through some fine mineral country containing gold, silver and coal deposits, plenty of timber, and good grazing lands. Durango is the ultimate objective point. No organization has yet been formed, nor is it given out what interests are behind the proposition.

**Nova Scotia Roads.**—The Halifax Board of Trade is urging the Provincial Government to agree to the granting of a subsidy for the construction of a road from Shelburne to Halifax or Dartmouth. The proposed road would go through the Queens County gold fields. The scheme for building a narrow-gauge road along the south shore of Nova Scotia, from Yarmouth to Shelburne, has taken definite shape. A local government subsidy has been promised and a Dominion subsidy is expected.

**Oakland & San Francisco Terminal.**—This company has been incorporated in California with a capital stock of \$1,500,000, of which \$700,000 is subscribed. E. M. Smith, of Oakland, holds a large majority of the shares, and the other stockholders are Alton H. Clough and W. E. Rudolph of Oakland and F. B. Pritchard and William Thomas of San Francisco.

**Path Valley.**—At a meeting of the Board of Directors held at New Germantown, Pa., Nov. 15, it was decided to extend the road on from Dry Run to Fannettsburg, an increased distance of eight miles, and the line as laid out by Engineer Dechant was adopted. Over two miles of the road has already been graded west of New Germantown, and on Nov. 17 a force began the work of grading on the west side of the mountain near Dry Run. President Gring says that the new line will be in operation by July 1.

**Pittsburgh, Fort Wayne & Chicago.**—The double tracking work on this division of the Pennsylvania lines is about closed up for the present year, although some work is still going on in the vicinity of Crestline, O., and the new second track may be finished to that town during December. This will make the Fort Wayne line a double track road for 190 miles from Pittsburgh. So far this year 90 miles of new second track has been built, 14 miles of this new track being in Indiana and the balance, 85 miles, being located in Ohio.

**Restigouche.**—This road is now located about 10 miles from Campbelltown, Ont., and the company expects in a short time to have the first 15 miles ready for contractors. It will be very easy of construction, no engineering difficulties having been met so far.

**San Diego & Phoenix.**—The Metropolitan Trust Company, of New York, has been made the trustee of an issue of first mortgage bonds amounting to \$4,000,000, which have been authorized by the stockholders of this projected line. The road is being built from San Diego toward Yuma, Cal., about 175 miles. When the first 10 miles is completed it is proposed to issue the first \$200,000 in bonds to complete the second 10 miles. About five miles of the road has now been graded and some track laid, all the work so far done being through funds subscribed by local citizens. W. H. Carlson, of San Diego, is President, and F. H. Dixon is Secretary.

**Santa Fe, Prescott & Phoenix.**—Work on the road in Arizona is still going on and is making steady progress, about 200 men being now employed between Prescott and Phoenix. The road starts at Ashfork, on the Atlantic & Pacific, and has for several months been completed into Prescott, 160 miles. It will be built into Phoenix some time next summer.

**Southern Pacific.**—John P. Hughes, of Fort Worth, Tex., who is building the new branch of the Louisiana Western road from Crowley, La., reports that the work is now nearly completed on the 21 miles of line north of that town. The contract for this 21 miles was let to him in July. Since then a new contract has been awarded for extending the line about eight miles farther north, and the work on this section is also nearly finished.

**Toledo & Ohio Central.**—The company has opened for business the extension of its western division, which completes the company's line between Toledo and Columbus. In addition to other facilities, this new line establishes a connection with Chicago for the lower part of the company's main line and also its Kanawha and Michigan divisions. The new road extends from Ridgeway to Columbus, 50 miles.

**Tuscarora Valley.**—The extension from East Waterford, Juniata County, the present southern terminus to Dry Run, Franklin County, Pa., is already graded for over a mile at the Dry Run end, where work was begun several weeks ago. The line will run through the Concord Narrows and will be about 15 miles in length.

**Unadilla Valley.**—The Delaware, Lackawanna & Western has agreed to operate the line between Bridge-water and Leonardville, N. Y., for freight traffic during the winter. The line has been completed between these points for some time, the distance being about five miles. The road is graded south of Leonardville for about eight miles, and it is thought that it will be completed next year as far as New Berlin, N. Y., 15 miles altogether.

**Wilkes Barre & Eastern.**—Coal traffic over the new line began Nov. 17. At a few points near the Pocono mountains the track has caved in several times owing to quicksand bottom. But this trouble will be remedied within a week or so. The freight and passenger stations in Wilkes Barre, Pa., will be completed in the spring. No through passenger trains will be run until next April.

#### GENERAL RAILROAD NEWS.

**Altoona, Clearfield & Northern.**—F. G. Patterson has again become President and General Manager of this road, the Supreme Court of Pennsylvania having last week reversed the decision of the lower court, which gave the control of the road to S. P. Langdon, of Philadelphia, and the directors friendly to his interests.

**Atlantic & Danville.**—Judge Hughes, of the United States Court at Norfolk, Va., has issued a decree for the foreclosure of the road and its sale at auction on Dec. 11, by Charles Sharp, of Norfolk, and C. B. Alexander, of New York City, as Commissioners.

**Baltimore & Ohio.**—The annual report submitted at the stockholders' meeting in Baltimore this week gives the gross earnings for the year ending June 30 as \$26,214,807, the expenses \$19,041,981, and the net earnings \$7,172,825, the latter being \$27,157 less than the net earnings of the previous year. The gross earnings increased \$337,449 and the expenses \$509,025, chiefly owing to improvements. The total income of the company was \$9,210,666. Deducting interest and other charges, a balance of \$2,513,440 remained, showing \$68,706 decrease. Dividends were paid on the preferred and common stocks, leaving a balance of \$1,558,818. The gross earnings increased 1.30 per cent., the expenses increased 3.30 per cent., and the net earnings decreased 3.65 per cent. Freight earnings decreased 1.01 per cent., passenger earnings increased 8.05 per cent. The increase in tons moved was 3.92 per cent., and the increase in passengers carried was 4.67 per cent. There has been spent during the year \$2,523,025 for construction and betterments, an increase of \$327,523. More than \$1,000,000 was spent on the main line and branches, \$400,000 east of Baltimore, \$633,000 on the Pittsburg Division, and more than \$482,000 west of the Ohio River.

**Brooklyn, Bath & West End.**—This road, which extends from Thirty-sixth street, Brooklyn, to Coney Island, about seven miles, has recently substituted the electric trolley for steam locomotives as a motive power. It is intended to run trains more frequently than hitherto, about every hour from Brooklyn, and every 15 minutes from certain intermediate stations.

**Cleveland, Lorain & Wheeling.**—Under the articles of consolidation filed by this road and the Cleveland & Southwestern, 80,000 of the new issue of 130,000 shares of stock are to be common and 50,000 preferred. The basis of exchange of stock is \$100 of the preferred of the Cleveland & Southwestern for \$80 of the new, and of the common one share for three. The preferred stock of the Cleveland, Lorain & Wheeling will be exchanged share for share, and the common at the rate of one for two shares in the new. Bonds for \$5,000,000 will be issued to pay outstanding indebtedness, including redemption of bonds of the old companies.

**Central of Georgia.**—Receiver H. M. Comer has filed with the United States Court in Georgia his report of the operations of the system for the year ending June 30. The following statement shows the earnings and expenses of the lines during that period:

	Earnings.	Expenses.
Central Railroad.....	\$2,588,409	\$1,886,135
Mont. & Enfalua.....	255,130	283,150
Savannah & West.....	1,271,390	1,568,715
Savannah & Atl.....	25,088	39,963
Augusta & Savannah.....	254,945	163,246
Southwestern.....	1,016,769	957,769
Mobile & Girard.....	207,924	196,392
Macon & Nor.....	82,294	76,359
Ocean S. S. Co.....	2,017,480	1,803,703
Central Railroad Bank.....	15,691	12,400
Totals.....	\$7,823,125	\$6,967,853

There were the extraordinary expenses for rails, tunnels, Macon station, etc., amounting to \$493,187, leaving the balance of net earnings of the system proper, available for other purposes, \$249,884.

Of leased lines, Augusta & Savannah shows net earnings of \$91,688; Southwestern net earnings, \$59,000; Mobile & Girard, net, \$11,532, and Macon & Northern from Sept. 6, 1892, to March 23, 1893, net, \$5,935. Amount of floating debt, including interest and commissions to July 1, 1893, \$5,803,025; amount of stocks and securities owned by the company, \$10,415,546; amount of obligations March 4, 1892, \$45,643,230, on which fixed charges are annually \$2,382,396.

**Chicago & Southeastern (Indiana).**—The affairs of this road seem to be in continual litigation and it is almost literally true that one receiver is no sooner discharged by the court than his successor is appointed, either in suits by objecting stockholders or by creditors. The President of the company is Henry Crawford, of Chicago, and he is said to be the principal stockholder, but his management meets with considerable opposition from minority stockholders. Last week Leonard Wild was appointed Receiver, his first action being to replace all the former officers of the company. The Crawford management, however, secured an injunction from the Indiana Supreme Court against him, so that at present they remain in control of the road.

**Columbus, Shawnee & Hocking.**—A special meeting of the stockholders has been called for Dec. 20, at Columbus, O., the object of the meeting being to consider the ratification of the agreement already made by the directors of this company and of the Sandusky & Columbus Short Line for the consolidation of the two properties. This consolidation has been looked for as a matter of course, and it was to have been effected at the annual meeting of this company which was held in October last. It was stated by the officers at that time that the entire matter had been postponed and would not be taken up again for perhaps a year. The Sandusky & Columbus Short Line was built in 1892 to Sandusky to give this road an outlet to the lakes for its coal traffic. The line was opened this year and has been carrying the freight of the Columbus, Shawnee & Hocking under a special agreement. It has been operated in close connection with that road, but still independent of it. Both roads have been managed by the same General Manager.

**Galveston, Houston & Henderson.**—In the United States Circuit Court, at Galveston, Tex., Judge Boardman has dissolved the temporary injunction under which the Missouri, Kansas & Texas has been operating, jointly with the International & Great Northern, the line of the Galveston, Houston & Henderson between Houston & Galveston. This leaves the International & Great Northern in possession of the road till the final hearing in the Circuit Court of the suit brought by the Missouri, Kansas & Texas, attacking the validity of the International & Great Northern's lease of the Galveston, Houston & Henderson.

**Georgia Southern & Florida.**—A decree for the sale of this road on March 1 next has been made by the Georgia Superior Court, in the suit brought by the Mercantile Trust Co., of Baltimore, for the bondholders. The Macon Construction Co. opposed the granting of the order. The order of the court also provides for the sale of the Macon & Birmingham road on the same day. The case will be appealed by the Macon Construction Co.

**Grand Trunk.**—The company offers to present stockholders for subscription \$500,000 of perpetual four per cent. consolidated debenture stocks at 94. The objects of this issue are to replace \$122,600 spent in redeeming the Northern extension bonds and to replace the terminable loans. The directors claim the result will be to reduce the interest charges.

**Lancaster & Reading Narrow Gauge.**—On Nov. 20 the operation of the road was abandoned by the Philadelphia & Reading. Receivers and the trustees, John Keller and Michael Reilly, appointed by the bondholders, assumed control. The equipment has been leased from the Cornwall & Lebanon. Four trains will be run between Lancaster and Quarryville, Pa., each way daily.

**Mexican Southern.**—This railroad, which extends from the City of Mexico to Oaxaca, has been placed in the hands of a receiver. The road was completed about two years ago, and since then its operation has been interrupted for months at a time, on account of landslides. The road is built through a mountainous region, and the heavy rains, after an unusually prolonged dry season, no rain having fallen during the years that the road was building, did great damage to the roadbed. The line is perhaps the most thoroughly constructed piece of track for a new road ever built in Mexico. It is said that nearly \$2,000,000 has been spent in rebuilding portions of the line, and this great expense is the cause of the present financial embarrassment of the company. The line is narrow gauge, 228 miles long.

**Missouri, Kansas & Eastern.**—This line has been formally leased to the Missouri, Kansas & Texas, which owns a majority of the stock of the new corporation, and guarantees its bonds, both as to principal and interest. The Missouri, Kansas & Eastern has been constructed in the most thorough manner, and was built to give the controlling company a line into St. Louis. The new road is 166 miles long and is located on the north bank of the Missouri River for the greater part of the distance from Franklin, its western terminus, to the connection with the Burlington's new terminal line into St. Louis. The road is now operated for local traffic only.

**New York & Northern.**—The arguments of counsel in the suit for the foreclosure of the road under the second mortgage bonds have been in progress before Judge Dykeman, of the New York Supreme Court, for some days and were concluded on Nov. 21. The motion for a foreclosure is made by the Farmers' Loan &



Trust Co., trustee of the second mortgage bonds, on which interest due in June, 1892, is in default, and such a sale, if ordered, would be in the interest of the New York Central & Hudson River road, which controls and operates the road. Simon Sterne, of New York, and others acted as counsel for certain of the minority stockholders, owning more than 18,000 shares of the stock of the company, have defended the foreclosure suit, upon the grounds—first, that there was a technical defense to the action, which the railroad company, wholly under the control of the owners of the bonds, the New York Central & Hudson River Railroad Co., would not make. Secondly, that this foreclosure action is one of the steps of an illegal plan being carried out by the New York Central company to enable it to obtain possession, without adequate payment, of the property of the New York & Northern, a competing line. It desires to secure the Northern property, and especially its valuable terminals within the limits of the city of New York, amounting to some 32 acres. Defendants contend that the New York Central company, being the majority stockholder in the New York & Northern, cannot use its position to hold the company helpless, while it is destroying its existence by means of a foreclosure suit and sale; that if the company were free to provide for its own interest and its continued existence, means could or might be used by it to provide the means of meeting its defaulted coupons. As a legal proposition, defendants contend that the action of the New York Central company is, as to itself, *ultra vires*, and as to the victim company contrary to public policy, as well as to well recognized rules of law; that the New York Central company may not purchase the stock and bonds of the New York & Northern and foreclose the mortgage, inasmuch as it is a parallel and competing line; and for these reasons its purchase of stock and bonds was void and against public policy, in that its object was to prevent competition, and no rights could accrue to the New York Central as the owner of these bonds which would be enforced by a court of equity.

**Northeastern (Georgia).**—The State of Georgia assumed control of the operation of this road on account of default by the Richmond & Danville Railroad on bonds which the state had indorsed. The Governor, in accordance with the terms of the act authorizing the state indorsement of the company's bonds, on being informed of the default, seized the road, and Rufus K. Reaves, of Athens, was appointed State Agent in Charge. The road is 43 miles long, and has been under lease to the Richmond & Danville. The state indorsed the bonds to the amount of \$250,000 in 1878, to promote the building of the road.

**Nothern Pacific.**—At a meeting of the Board of Directors in New York this week, it was decided to make application to the court to appoint one of the members of the Board as one of the receivers.

**Philadelphia & Reading.**—Judge Dallas has entered the decree recommended by the Special Master, confirming the action of the receivers in the redemption of bonds of the company held by Prince & Co. and Ervin & Co., and in extending the Speyer loan.

**Sioux City Rapid Transit Co.**—A decree of foreclosure has been granted in favor of the Manhattan Trust Co., on \$250,000 worth of the company's bonds. The court held, however, that claims for labor and material, amounting to \$25,000, constitute a prior lien against the property.

**St. Louis Transfer.**—Edward B. Wolfe and other stockholders have applied in the United States Circuit Court of St. Louis for a receiver for this road, alleging mismanagement on the part of the present officers, and claiming that traffic which would naturally go to the St. Louis Transfer lines has been diverted to the lines of the Wiggins Ferry Co., which also does a freight transfer business at St. Louis. The executive and operating officers of the St. Louis Transfer in most cases occupy similar offices with the Wiggins Ferry Co.

**Toledo, St. Louis & Kansas City.**—An order has been issued by Judge Taft, of the United States Court at Toledo, directing that John C. Havemeyer, Herman O. Armour, James M. Harshorn, Otto T. Bannard and M. S. Paton, trustees and committee, be allowed to file an intervening petition in the case of Joseph S. Stout against the railroad. The representatives named above compose a reorganization committee which is trustee for over \$6,000,000 of the first mortgage bonds, which are in default, or about two-thirds of the total issue.

**Union Pacific.**—Conference between representatives of the different interests in the company were held in New York this week, among those present being Gen. Louis Fitzgerald, President of the Mercantile Trust Company; A. H. Boissvain, of Blake; Boissvain & Co., of London; Gen. G. M. Dodge, H. L. Higginson, of Boston; Samuel Carr, representing the estate of the late Frederick L. Ames, and Senator Calvin S. Brice, Chairman of the Senate Committee on Pacific Railroads. Senator Brice states that a committee will probably be selected to prepare a plan of reorganization which will be acceptable to the government and all other interests.

**Union Pacific, Denver & Gulf.**—The trial of the suit of ex-Governor Evans against the Union Pacific, calling for an accounting under the existing agreement, and the appointment of a receiver pending the suit, was begun before Judge Haller, of the United States Circuit Court, at Denver, on Nov. 20.

**Winona & Southwestern.**—In the United States Circuit Court at St. Paul on Nov. 16, Judge Caldwell appointed Joseph Walker, Jr., Receiver. A stay of proceedings was granted, and the arguments were made before Judge Caldwell on the 18th, and the case taken under advisement. The application for a receiver was made by the Farmers' Loan & Trust Company, of New York, Trustees under the mortgage. The specific claims were that the earnings of the road to the extent of \$119,000 have been diverted from their proper channels and that interest, amounting to \$38,110, due in October has not been paid. It appears that the Winona & Southwestern Improvement Co. entered into a contract with the railroad company to build and furnish complete, as regards right of way, construction and equipment, and were to receive therefor stock at the rate of \$20,000 and bonds to the extent of \$18,000 for each of the 375 miles to be built in extending the line from Winona, Minn., to Omaha, Neb. Only 117 miles of the road has been built, and the improvement company has received from the railroad company stocks and bonds to the amount of \$4,500,000. The improvement company is charged with non-fulfillment of contract, refusal to turn over the right of way and failure to supply the necessary rolling stock as was agreed in the contract.

The officials of the Winona & Southwestern, in their

answer, deny all these charges, and claim that it is an attempt to turn the property over to the Green Bay, Winona & St. Paul. Judge Caldwell has taken the case under advisement.

Judge Caldwell rescinded the appointment of Joseph Walker, Jr., as Receiver, and appointed in his stead Tilden R. Selmer, of St. Paul. An order of foreclosure and sale of the property was entered, and the Receiver will shortly advertise the property for sale.

**Windsor & Annapolis.**—Formal application has been made to the Dominion Parliament to authorize the sale of the Yarmouth & Annapolis road to the above company. The consolidation of these two lines has been long talked of, and if it is effected it will place the road along the north shore of Nova Scotia from Halifax to Yarmouth under one management. The Windsor & Annapolis road extends from Annapolis to Windsor, running into Halifax over the tracks of the Intercolonial road. It was connected with the Yarmouth & Annapolis road in 1892, when the Dominion Government built a connecting line between Annapolis and Digby, 20 miles, the previous terminus of the Yarmouth & Annapolis road, then called the Western Counties, so as to form a continuous line along the north shore of Nova Scotia.

#### TRAFFIC.

##### Traffic Notes.

The Union Pacific has made a rate of \$1.00 per 100 lbs. on apples in car loads from Portland and other points in Oregon to Eastern points as far as Chicago.

The Wilmington & Weldon road has just adopted the freight tariff prescribed by the North Carolina State Railroad Commissioners. In doing this the road has, it appears, voluntarily surrendered a right under its charter.

The New Orleans Car Service Association has yielded to the importunity of some of the consignees and lengthened the free time on some commodities, and has postponed for two weeks the establishment of the demurrage rules.

The Trunk Lines have adopted a resolution that after Dec. 3 no through bills of lading from Western or Canadian points to foreign ports will be issued on export bay, unless specific arrangements are made with the steamship lines for sailing within specific periods.

The boatmen on the Erie Canal tell the reporters that they have had a very profitable season owing largely to the fact that the railroad were unusually busy in carrying passengers, and maintained rail rates at six cents a bushel throughout the season. This was the second good season in ten years. About 100 boats have been built this season, making the fleet about 800.

The railroads centering in Atlanta, which for many years delivered freight to the stores free of cartage, but by agreement discontinued the practice some months ago, are going to return to the old custom on Dec. 1. Free cartage was begun by the East Tennessee, Virginia & Georgia, which was unable to secure a favorable location for its freight house. The agreement to discontinue involved the delivery of considerable bulk freight from several different roads over the tracks of the Western & Atlantic, and this road now objects to continuing the arrangement longer.

The National Transportation Association, which is composed of the Boards of Trade of various cities throughout the country, those having freight bureaus being the most prominent, held its annual meeting at Baltimore last week. The subjects discussed were about the same as those which have heretofore engaged the attention of this body, and it does not appear from the reports that much that was new was brought out. Mr. Carty, of Philadelphia, made a vigorous address, complaining that the trunk line railroads discriminate against Baltimore, Philadelphia and Boston in favor of New York. A committee was appointed to investigate the subject with E. P. Wilson, of Cincinnati, at its head. There were reports from the committees recommending that efforts be made to secure changes in railroad classifications of freight and to get the railroads to pay demurrage on freight delayed on the road. The officers for the ensuing year are: President, Wm. S. Young, Baltimore; Vice President, Frank Barry, Milwaukee; Treasurer, F. H. Magdenburg, Milwaukee; Secretary, George F. Stone, Chicago; Executive Committee, E. P. Wilson, D. W. Ranlet, Charles E. Wheeler, D. E. Richardson, R. C. Grier.

##### Chicago Traffic Matters.

CHICAGO, Nov. 22, 1893.

The Chicago Herald on Nov. 19 and 20 printed several columns of sensational matter about an alleged extensive scheme of forged tickets by which several of the Eastern roads had been victimized to the extent of over \$100,000. The story is a gross exaggeration, but inquiries of railroad officers show that a large number of counterfeit tickets were taken up in October, the total losses being perhaps \$5,000. The Erie on one day took up over 200 return portions of World's Fair excursion tickets which proved to be counterfeit. These represented one-half of an \$18 ticket, so that the loss to the road was about \$1,800. The Baltimore & Ohio found about 100 tickets of a similar kind. It appears that the stamp on the back of the tickets was easily detected in both cases. The Pinkerton detectives have had the case in hand for a month, and they say that they have the culprits identified, but they naturally have great difficulty in securing legal evidence against them, so they will not as yet give the names of the counterfeiters. The reports that large numbers of passengers were put off from trains for non payment of fare when they presented these tickets have not as yet been substantiated.

Western lines have agreed to pay commissions on World's Fair tickets sold during October. This decision was largely influenced by the determination of the Union Pacific to allow commissions, which the agreement of the Western Passenger Association did not recognize.

The Western Freight Association adjourned Nov. 16 after adjusting a number of local grievances. The general disposition of the meeting was against any rate reductions. Lumber rates from Eau Claire and other Chippewa Valley points to seaboard were adjusted to the same basis as obtains from adjacent territory.

There was a great scramble among the scalpers last week to unload their stocks of excursion tickets before the time limits expired, and it is reported that several of the gentry were badly "left." On Wednesday afternoon each of the numerous scalpers had from one to four runners out haranguing the crowds. Philadelphia rates fell to \$10 early in the afternoon; to New York the price was \$9, and to Buffalo \$5.50. Later in the afternoon, as the expiration limit approached, prices went by the board altogether. New York tickets were sold as low as \$4, the Philadelphia rate dropped to \$3.50, Buffalo, Harrisburg and Wheeling sold at \$2; Cincinnati, Louisville and Detroit and St. Louis went at \$1. Denver was never higher than \$3 during the afternoon and before 6 o'clock had dropped to any price named by the purchaser. Many went at \$2. St. Paul, Minneapolis, Duluth and Marquette rates dropped to \$1.

Transcontinental lines are considering whether to meet the reduced passenger rates now in effect by the Canadian Pacific. Before doing so, however, a strong effort will be made to remove the existing conditions which make it possible for the Canadian Pacific to consistently decline to join in a general advance in rates.

No progress is being made looking toward the inauguration of a plan for dividing the immigrant traffic among the Western roads. The Union Pacific is apparently unwilling to enter into any agreement, and it is not likely that that company will change its considered position in the matter.

Southwestern freight rates are to be restored to a basis of \$1.30 per 100 to Texas common points on Dec. 4. The old basis was \$1.33. The Rock Island made its consent conditional upon the adding of Fort Worth to the list of Texas common points, which has been done.

Holiday rates of a fare and a third where rates are three cents a mile have been agreed to by Western lines, and a fare and a fifth where the regular rate is over three cents, applicable east of the Missouri River and between points within 200 miles of each other.

The shipments of eastbound freight, not including livestock, from Chicago, by all the lines, for the week ending Nov. 18 amounted to 55,238 tons, against 54,932 tons during the preceding week, an increase of 306 tons, and against 71,024 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Nov. 11.		W'k to Nov. 18.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	5,132	9.3	5,849	10.6
Wabash.....	4,353	7.9	3,819	7.0
Lake Shore & Michigan South.	11,910	21.6	9,981	18.2
Pitts., Ft. Wayne & Chicago.	8,351	15.5	8,571	15.6
Pitts., Cin., Chicago & St. Louis.	7,513	13.6	6,991	12.7
Baltimore & Ohio.....	2,745	5.0	3,460	6.3
Chicago & Grand Trunk.....	2,921	5.3	2,682	4.9
New York, Chic. & St. Louis.	1,552	2.8	1,613	3.4
Chicago & Erie.....	5,903	10.6	6,515	11.9
C., C., C. & St. Louis.....	1,617	2.9	2,424	4.4
Totals.....	55,238	100.0	54,932	100.0

Of the above shipments 1,720 tons were flour, 21,471 tons grain and millstuffs, 9,553 tons cured meats, 12,010 tons dressed beef, 1,151 tons butter, 2,320 tons hides and 2,888 tons lumber. The three Vanderbilt lines carried 39.2 per cent., the two Pennsylvania lines 29.1 per cent. The Lake lines carried 80,933 tons, against 100,447 tons during the preceding week, a decrease of 19,494 tons.

(Other Chicago traffic news will be found on page 845.)

##### Interstate Commerce Commission.

The Interstate Commerce Commission, in an opinion by Commissioner McGill, has announced its decision of the case of the F. Schumacher Milling Company and its successor, the American Cereal Company, against the Chicago, Rock Island & Pacific, and several intervening carriers, in favor of the defendants. The case involves classification of cereal products and flour, and the allowance of a mixed carload rate for those commodities. The Commission decides that the complaining company has shown no reason why roads using the Western classification should adopt the official classification as to cereal products. Neither is there sufficient evidence in this case to justify an order directing the defendants to establish the mixed carload rate prayed for in the complaint, but this will not preclude the filing of another complaint, based on other grounds and raising the question of unreasonable or relatively unreasonable rates on cereal products.

The Interstate Commerce Commission, in an opinion by Commissioner Clements, has announced its decision in the case of Blanton Duncan against the Atchison, Topeka & Santa Fe, the Southern Pacific and the Louisville & Nashville. The decision says:

"The remedy of a party for goods shipped resulting from delay, detention, loss, breakage and other deterioration or damage not attributable to a violation of any provision of the act to regulate commerce is by appropriate action in the courts. Where a contract is made with a shipper by a carrier, member of a through line, for shipment of goods over the line at less than the published lawful rate charged shippers in general, it is not a violation of the act to regulate commerce for the delivering carrier to exact payment of the full lawful rate before delivery. There is no necessary connection or relation between the rates on traffic of the same class transported between the same points in opposite directions over the same road, and the fact that such rate in one direction is materially higher than that in the opposite direction does not, as in case of hauls over the same line in the same direction, establish *prima facie* the unreasonableness of the higher rate. This is especially true where the hauls are of great length.

"The rates charged on household goods will not be declared unlawful on the mere fact that as a condition of granting them the defendants require the shipper to release all claim for damages in case of loss to the amount of \$5 per 100 lbs., or \$1,000 per carload, there being no proof showing that such rates are unreasonable in view of said limitation. In cases of loss the shipper's remedy is at law. Under the Western classification and tariff there are two westbound carload rates from Mississippi River points to Pacific Coast terminals on goods termed 'emigrants' movables, one a general class rate and the other designated a 'commodity' rate and less than the general rate; the latter rate is published as being open to 'intending settlers only'; but in practice it is given to shippers indiscriminately, and does not appear to be unreasonable in itself. It is held that there is neither propriety in nor necessity for retaining in the classification and tariff both of the two rates, or the statement in connection with the commodity rate that is open to 'intending settlers only,' as their retention can only serve to mislead the public and afford opportunity for the practice of favoritism and unjust discrimination as between shippers; also that the westbound rate on 'emigrants' movables, including household goods, from Louisville to Los Angeles, should not be in excess of the amount of said commodity rate thereon.

"The agreement of the Transcontinental Association on file with the Commission is not on its face a contract or agreement or combination for the pooling of freights or division of earnings between different and competing railroads, such as is declared unlawful by Section 5 of the Act to Regulate Commerce."